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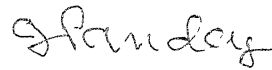
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PERCEIVED INTENSITY OF ENVIRONMENTAL STRESSORS AND ITS IMPACT ON HEALTH

ABSTRACT

A Thesis
Submitted to
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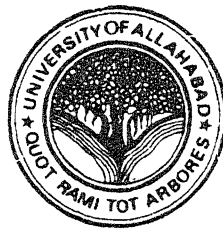
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University of Allahabad
Allahabad
1999

Perceived Intensity of Environmental Stressors and its impact on Health

Abstract

Environmental issues are on the top of the agenda list of the world today. The major environmental problems of the present world are depletion of resources, pollution, acid rain, hole in the ozone layer, nuclear waste, destruction of rain forests, land satiation and famines, loss of bio-diversity, industrial effluence and many others. The urban environmental pollution has particularly drawn the attention of the general public, Governments, and international organisations. Urban population is rapidly increasing worldwide. The growth of urban population, particularly due to migration from rural to urban, especially in developing countries like Nepal, has resulted in many negative features such as urban poverty, deprivation and environmental degradation. The increase in urban population has negative impact on water supply, solid waste management, control of air pollution and food hygiene both in quantity and in quality. The urban environmental condition is the focus of present study. Three aspects of pollution, i.e., air, garbage and water pollution, are included in the study. The main objective of the study is to investigate the city residents' perceptions of environmental pollution, their experienced stress, their coping strategies and their health status.

The survey was conducted in Kathmandu, the capital city of Nepal. Respondents were predominantly from the lower-middle socio-economic class residing in centre of the city (Bahal) and outskirts (Non-Bahal). The sample consisted of 209 city dwellers, of which 100 were males and 109 were females with almost equal ratio of migrants and non-migrant (local) respondents. A structured interview schedule was developed in Nepali language, which consisted of background information, and scales to measure perceived intensity of

pollution, control over pollution, experienced stress, and coping strategies related to environmental pollution, life events and health.

The result revealed that people with increasing age, in general, perceived lesser intensity and control of pollution, experienced lesser pollution stress, and used lesser amount of problem-focused coping strategies to deal with pollution. Respondents with increasing educational levels used greater amount of problem-focused coping strategies to deal with pollution, and reported lesser physical and psychological health problem. The findings further suggest when individuals perceive greater intensity and lesser control of pollution they experience greater stress. The findings also indicated that individuals who perceive lesser control over pollution, use greater amount of emotion-focused coping, but who perceive greater control over pollution use greater amount of problem-focused coping strategies to deal with pollution.

ANCOVAs were computed for the main effect of gender, location and residential status (migrant or non-migrant). Respondents' age, education and family income were the covariates. The results of ANCOVA revealed that males and females significantly differed in emotion-focused coping in dealing with garbage and water pollution, problem-focused coping for dealing with water pollution, and also in their psychological health. The results revealed that females used greater amount of emotion-focused coping strategies to deal with garbage and water pollution than males. Females also used greater amount of problem-focused coping strategies to deal with water pollution than males. The greater use of problem-focused coping strategies by females than males fit with the gender-role in the Nepalese society since females are primarily responsible for managing water for their family. Females also reported greater health problems than males. The ANCOVA results revealed that the Bahal respondents perceived greater control over garbage and water pollution than the non-Bahal respondents. The non-Bahal respondents reported greater amount of physical and psychological health problems than the Bahal respondents.

The results of ANCOVA further revealed that migrants perceived greater intensity of air pollution, used greater emotion-focused coping strategies to deal with water

pollution, and reported greater amount of psychological health problems than non-Bahal respondents. Whereas the non-migrant respondents perceived greater control over water pollution than the migrant respondents did.

Regression analysis revealed that experienced stress related to pollution, followed by life events were the most important among groups of predictor variables explaining the variance related to physical and psychological health. Emotion-focused and problem-focused coping strategies for dealing with pollution were predicted significantly by perceived control and experienced stress related to environmental pollution.

The study has certain limitations. The sample was small and selected from only two types of neighbourhoods, i.e., central city (Bahal) and outskirts (non-Bahal). For the generalisation of the findings, sample should be larger and should be selected from more locations of the city. The impact of environmental pollution on health should be studied with more sophisticated research designs.

The findings indicated the significant role of education, in general, in dealing with pollution as well as in the status of people's health. Therefore, it is suggested to provide environmental education for people to make them aware of the impact of pollution on health and to enhance their efficacy for dealing with pollution.

PERCEIVED INTENSITY OF ENVIRONMENTAL STRESSORS AND ITS IMPACT ON HEALTH

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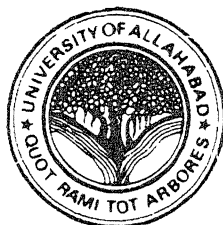
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CHAPTER 1:

INTRODUCTION

Introduction

This research project was aimed to study the alarming situation of environmental pollution, specifically, air pollution, garbage accumulation, and water pollution, in Kathmandu, the capital city of Nepal. The main objectives of the study were to investigate the perception of environmental intensity, control, stress, and coping strategies to deal with the environmental pollution of the city dwellers and their health status

This chapter is organised in five sections (1) Environment The Global Issue, (2) An Overview of Environmental Psychology, (3) Environment The Scenario of a Nepalese City, (4) Environmental Stress, and (5) Emerging Research Questions, Objectives and Hypotheses

Environment: The Global Issue

In the last quarter of this century, the environmental decline has been so rapid that environmental issues have become number one for most of the national as well as international agendas. The issue of environmental quality in the process of economic development and consequences of such development has drawn attention of general public, Governments, and international organisations. Depletion of resources, pollution, acid rain, the hole in the thinning ozone layer, nuclear waste, destruction of tropical rainfall, land saturation and famines, loss of bio-diversity, industrial effluence and many others have emerged as the major environmental problems of the present world. These problems have not appeared all of a sudden, but they are the outcomes of developmental activities carried out by people in different countries of the world. For more than a century, the tendency of all development activities has been of industrialisation and urbanisation as symbols of national growth and progress. Industrial Revolution in the last century and the World Wars of this century are important events of the human history, which have changed significantly people's lives. McNeil, Winsemius and Yankushij (1991) report that "Since 1900, the world's population multiplied more than three times, its economy has grown twenty fold, the consumption of fossil fuels has

grown by a factor of thirty and industrial production by a factor of fifty. Most of that growth, about four-fifth of it, occurred since 1950"(p.3) After the two World Wars, there were high demands and pressures for reconstruction and development. Almost universally, it was accepted that economic growth depends on rapid industrialisation. Developmental policies mainly concentrated on increasing production and reducing poverty attempting a transition from an agrarian economy to an industrial economy. The whole force of the countries was utilised to develop scientific technologies for economic progress. The advancement of science and technology during 1960s made radical and rapid transformation, as a result, the pursuits of economic and technological development caused the exploitation of natural resources to which society was oblivious. Without serious future planning, natural resources were used thinking that nature has abundant resources, which can never be depleted or destroyed. The blind enticement of economic growth through the technological advancement and industrial development sidelined the environmental issues till the late 1960s. It was only in recent decades, publications focusing on the silent spring of environmental pollution (Carson, 1968), the population bomb (Ehrlich, 1968), and the tragedy of commons (Hardin, 1968), and technological disasters such as the nuclear accidents in Three Mile Island (1979), in Chernobyl (1986), and industrial gas accident in Bhopal (1984), have awakened the society to the immediate impact of the physical environment on human survival. Consequences of serious mistakes of the past are now being realised. The social scientists in the west are not satisfied with such kind of development, as McCormick (1989), among many others, views, 'Materialism, technology power, profit and growth were characterised as symbols of all that was worst about western society as posing a threat to the environment '(p 64)

The concern of the decline of environmental quality is a legitimate issue. The nature of environmental decline has multiple issues. Some issues are global and some are local. To solve the environmental problems at the national level, some efforts have been made by most of the countries. Different national Governments have now established a separate ministry of environment to make plans, strategies to improve the environmental quality locally and are functioning through several programmes and activities according to their needs and priorities. However, there are obvious differences between the developed and developing countries of the world on the issues and strategies, planning, and activities towards the environmental protection and improvement. Developing

countries are more concerned about issues such as soil erosion, land salinity, desertification, water pollution, urban air pollution, solid waste, and deforestation along with the high population growth and increasing poverty. The developed countries, on the other hand, have been more concerned about the broader problems of environment such as global warming, depletion of ozone layer, and loss of bio-diversity. The developed countries are more concerned with these broader environmental issues because they have more or less solved or have under their control those environmental problems that developing countries are facing. The developed countries' problems are more associated with industrialisation and its outcomes. Thus, the priorities are different between the developed and developing world for the environmental protection and improvement. According to the priorities, the plans, programmes, and activities are carried out and they are also different.

The developing countries have little power to change or reduce the global environmental pollution. These poor countries lack resources required to act, maintain or improve the environmental quality. At the same time, they are facing more intensity of environmental pollution, which is attributed to the explosion of population. Southwick (1976) argues, with more people, there will be more sewage, more solid waste, more carbon dioxide in air, more fertiliser and insecticides being used to produce food for hungry mouth. This uncontrolled population growth poses threat to the natural environment on account of sprawling settlements. They are forced to trade-off long-term sustainability against short-term survival.

Thinking that it is the joint responsibility of nations, both developed and developing, to save the environmental quality of the earth from human activities that are dangerous, global environmental movements are taking place and programmes and activities are carried out through several national and international agencies. There are several international organisations that are working for the improvement of the environmental quality. International Union for the Conservation of Nature and Natural Resources (now, IUCN-The World Conservation), established in 1948, is the largest professional world body working to conserve the earth's soil, land, water, air and life system and active in over 120 countries.

The United Nations, especially United Nations Environment programme (UNEP), is another international organisation, which has been stressing environment in the context of development. After the first United Nations Conference on the environment 20 years ago in Stockholm, the UN sponsored Earth Summit was held in Rio de Janeiro, Brazil in 1992 to consider the state of global environment. The key issues discussed in the Earth Summit were growing concerns about the current trends that are not sustainable. The Summit forewarned that the present pattern of human activity, if continued, would lead to major decline in the condition of nature and the quality of human life.

Another International organisation, the Global Environmental Facility, established in 1990, attempts to bring about collaboration on financing global environmental problems between the World Bank, UNDP, and the UNEP. International NGOs like Greenpeace have been working to improve environmental quality and management.

Roy (1996) points out that the international conventions and protocols also focus on these environmental issues, which are global in nature, i.e., not limited to geographical and political boundaries. Some of these conventions are the 1985 'Vienna convention for Protection of the Ozone layer for research, monitoring, and exchange', signed by 20 countries, and the 1987 Montreal Protocol on Substances that deplete the ozone layer, later amended in 1990.

An Overview of Environmental Psychology

The environmental and ecological concern of the 1960s helped to generate scholarly interest in the effects of environmental problems on human behaviour and health. In the late 1960s, environmental psychology, a new area within the field of psychology, emerged as a problem-focused discipline that was the product of societal forces and intellectual activities within the behavioural sciences (Stokols, 1977). During late 1960s and early 1970s, the study of human and physical-social environment relationships appeared as one of the fastest growing areas of psychological research (Altman, 1973, 1975, Barker, 1968, Canter & Lee, 1974, Craik, 1970; 1973, Downs & Stea, 1973, Hall, 1966, Ittelson, 1973; Lang, Burnette, Moleski, & Vachon, 1974, Lynch, 1960, Newman,

1973, Proshansky, Ittelson, & Rivlin, 1970, Sarrinen, 1976, Sommer, 1969, Wohlwill, 1970) With the publication of special issue of the Journal of Social Issues on "Man's Response to the Physical Environment" (Kates & Wohlwill, 1966) the first collective interest among psychologists in environmental issues became evident The publication of Environment and Behaviour, the first journal specialising in this type of study, began in 1969 (Winkel, 1969), followed by other journals, Non-verbal Behaviour and Environmental Psychology, Population and Environment (1978), and Journal of Environmental Psychology (1981) In 1981, a special issue of the Journal of Social Issue on ' Environmental Stress' was devoted to the current environmental problems (Evans, 1981) Later, the articles were also published in a book entitled 'Environmental Stress' (Evans, 1982)

The first review article in environmental psychology was published in the Annual Review of Psychology by Craik (1973) and approximately every four years other reviews are being published (Holahan, 1986, Russell & Ward; 1982, Saegert & Winkel, 1990, Stokols, 1978, Sunstrom, Bell, Busby, & Asmus, 1996)

The recent collective works on environmental psychology appeared in two volumes of Handbook of Environmental Psychology edited by D Stokols and I Altman (1987) These volumes have tried to include research works in environmental psychology not only done in North America but also in other parts of the world

The initial research interest began in the physical characteristics of the environment (Proshansky et al , 1979) and developed into larger issues of 'the interface between human behaviour and the socio-physical environment' (Stokols, 1978, Stokols & Altman, 1987) Similarly, observing the development of environmental psychology, Baron and Byrne (1998) have recently pointed out that the initial research started how presence of others influence us (e g , studies of crowding) and during the 1960s and 1970s, interest broadened to include a variety of negative behavioural effects caused by environmental variables such as noise, heat and air pollution In the 1980s and 1990s research increasingly concentrated on how human behaviour negatively influences the environment and also on the ways to change this behaviour

Reviewing the research literature, Stokols (1995) has recently reported six major trends in environmental psychology (a) development of novel constructs and method for analysing the links between environment and behaviour, (b) increased emphasis on cross-paradigm research, (c) transactional models of environment and behaviour, (d) group-environment as well as individual-environment relationships, (e) expanded application of environment and behaviour research to the development of public policies and community problem-solving efforts, and (f) broadened international scope of environment psychology.

Many environmental psychologists have observed that environmental psychology has not grown to the point where it can match the other fields of psychology (Proshansky, 1990) According to Ittelson (1995), the identity of environmental psychology as a distinct field of inquiry has become more diffused and the hope for "grand" or "overarching" theory of environment and behaviour has not achieved Stokols (1995) sees the rapid growth of environmental psychology and its institutionalisation, accompanied by an apparent diffusion of its own identity as a paradox Answering the questions of paradox, he has argued that although environmental psychology can be viewed as branch of psychology research (Russell & Ward, 1982), it is more accurately characterised as part of multidisciplinary field of environment and behaviour that integrates the conceptual and methodological perspective of artitecture, urban planning, psychology, anthropology, sociology, geography, and other disciplines (Altman & Christensen, 1990, Saegert & Winkel, 1990, Zube & Moore, 1991) Even though this multidisciplinary quality has contributed to the innovative and eclectic nature of environmental psychology, it has resulted in a more diffused identity of the field as a whole Stokols also argues that the scope of environmental psychology has increased internationally over the past three decades The broad range of research topics addressed by environmental psychologists in different countries using different theoretical, methodological, and policy concerns have been shaped by a variety of indigenous, cultural, political, and geographic conditions (Hagino, Mochizuki, & Yamamoto, 1987, Kuller, 1987, Moore, 1987, Pol, 1993, Sanchez, Wiesenfeld, & Croñic, 1987; Singh & Singh, 1991). Further he argues that the gradual diffusion of environmental psychology's identity is due to overlapping of conceptual and methodological principles that are so fundamental to all the areas of psychology Stokols has anticipated that virtually all areas of psychology will become increasingly "environmental" in future while considering psychologists' growing interest in

contextual influence on behaviour (Altman & Rogoff, 1987; Bronfenbrenner, 1989, Rosnow & Georgoudi, 1986, Stokols, 1982, Wapner, 1987) and their concerns about the behavioural dimensions of global and regional environmental problems (Baum & Fleming, 1993; Cvetkovich Earle, 1992; Gifford, 1993; Stern, 1992, Vaughan, 1993, Wandersman & Hallman, 1993)

Environment: The Contemporary Scenario of Kathmandu City

Urban population is increasing rapidly worldwide. Among members of South Asian Association for Regional Co-operation (SAARC), excluding Bhutan, Nepal has the lowest proportion of urban population. However, the growth rate of urban population in Nepal is seen to be the one of the highest in the region, 77 percent of increase during 1981-1991 (Bastolá, 1995). The growth of urban population, shifting from rural to urban areas, has led to many negative features such as urban poverty, deprivation, and environmental degradation, particularly in developing countries like Nepal, because of lack of adequate infrastructures and urban planning. The increase in urban population has made negative impacts on the service of water supply, sewerage, solid waste collection and disposal, and control of air pollution and food hygiene both quantitatively and qualitatively. The increase of new users outstrips existing capacities and in case of failure, a number of environmental problems occur. Urban concentrations intensify the deficiencies of housing, capacity of transport, and shortage of food and distribution. Further, the deficiencies magnify crowding, noise pollution, air pollutants, and accumulation of garbage in streets.

The environmental condition was the major focus of this study that comes under the rubric of pollution. In this section, the state of environmental conditions (air, garbage, and water pollution) in Kathmandu City is presented. The consequences of pollution on human health are also briefly highlighted.

Environmental pollution is an inevitable outcome of human craving for better living standards through increasing efforts and activities manifesting themselves in fast industrialisation and consequent urbanisation. With the growth of urban centres, the urban population is also increasing. The increased populations need more vehicles,

which exhaust more harmful gases, generate more garbage and pollute water sources, if not well planned, the ultimate consequence is that urban centres turn into pollution centres

Environmental pollution is a man-made condition that adversely affects the quality of man's natural environment. In other words, it is the unfavourable alteration of our surroundings, wholly or largely as a by-product of man's actions, through direct or indirect effects of changes in energy patterns, radiation levels, chemicals and physical constitution and the abundance of organisms. The most important consequences of environmental deterioration are direct threats to human health.

Pollution is the most frequently used and discussed term in the context of present day environmental crisis. Pollutants enter to human organism through the air we breathe, the water we drink, the food we eat, and the noise we hear. Pollution may be defined as any direct or indirect alteration of the physical, thermal, biological or radio-active properties of any part of the environment by discharging, emitting, or disposing wastes, or substances as to affect any beneficial use that are adversely to cause condition which is hazardous or potentially hazardous to public health, safety, or welfare or to animals, birds, wildlife, fish or aquatic life or to the plants (Gilpin, 1976).

Pollutants may be classified into two groups: visible and invisible. Visible pollutants include chimney smoke, wastewater coming from discharge and garbage disposed-off improperly at various sites in the city. Invisible pollutants include various bacterial species and viruses, which cause health hazard to human health. Sewage wastes are discharged into streams, rivers, lakes, and coastal water and because of contamination of pathogenic bacteria, water-borne diseases such as typhoid, bacillary dysentery and hepatitis spread. Among the notable types of pollution, air pollution, water pollution, and solid waste pollution pose serious problems to the quality of environment. Consequently, these types of pollutants are dangerous and harmful for healthy living.

Air Pollution

Air pollution is perhaps the most common form of environmental degradation in the cities of both developed and developing countries. However, developing countries like Nepal

are suffering from air pollution more than developed countries due to lack of resources, less priority and efforts of the government for the management and control

Air is the most essential thing for survival of all animals including human beings. Air constitutes 80 percent of the total daily intake by weight and a person breathes 22,000-times a day inhaling about 16-kg of air. It shows that air is very important for our survival.

Air pollution may be defined as 'the presence in the outdoor atmosphere of one or more contamination such as dust, fumes, gas mist, door smoke or vapour in quantities, of characteristics, and of duration such as to be injurious to human, plant or animal life and to property, or which unreasonably interferes with the comfortable enjoyment of life and property' (Perkins, 1970). In other words, in a strict sense, air may be considered polluted when there is added to it any substance foreign or additional to its normal composition. Air pollution is usually restricted to those conditions in which the general atmosphere contains concentrations which are harmful or likely to be harmful to man or to his environment (Gilpin, 1976).

There are other definitions of air pollution, which refer to contamination of unwanted toxic substances in concentration. According to Perkins (1970), substances present in the atmosphere in concentrations intense enough to interfere directly or indirectly with man's comfort, safety or health or with the full use or enjoyment of his property.

Air pollution is complex in its origin and type and also creates severe problems of massive proportions. These pollutants range from visible to invisible odourless gases such as carbon monoxide. The main source of emissions are manufacturing processes, power generation, transportation, waste disposal, chemical processing, domestic activities, agricultural operations, forest fires, and a wide variety of other sources or events.

Air Pollution in Kathmandu: In 1990, World Resource Institute (WRI) estimated Nepal's contribution to the global greenhouse effect through the emission of CO₂ (expressed in terms of total carbon content), methane (CH₄), and chlorofluorocarbons (CFCs). WRI reported that Nepal's anthropogenic additions to the CO₂ flux included 14,000 tons of carbon from cement production, 62,000 tons of carbon from combustion

of liquid fossil fuels, and 6.7 million tons of carbon from annual land use change, totalling 6.9 million tons of carbon.

The Kathmandu valley is especially vulnerable to air pollution due to its bowl-like topography, dense population, valley centric industrial development, and relatively large numbers of automobiles (Fleming, 1977). The bowl-like topography restricts the wind movement and retains the pollutants in the atmosphere, especially during periods of thermal inversion over Kathmandu where cold air flowing down from the mountains is trapped under a layer of warmer air, which acts like a lid over a bowl.

In Kathmandu, the major source of air pollution is transportation. It is estimated that more than 100,000 vehicles run on the roads of Kathmandu City. Due to increasing consumption of fuels for energy day by day, emission of toxic gases into the atmosphere takes place, causing deterioration of air quality of the environment or pollution of natural air. It is estimated that vehicles exhausted about 570 tons of total suspended particles (TSP), 570 tons of particulate matter of 10 microns or less (PM_{10}), and 82-495 tons of sulphur dioxide (SO_2) in 1993 (URBAIR, 1997).

Apart from motor vehicles, industrial and commercial activities are also main contributors of air pollution in Kathmandu. Industrial growth has taken place in Kathmandu for the last 10 years. In 1986-87, there were about 1,504 industrial establishments with more than 10 employees, which have increased up to 2,200 in 1991/92. The main source of air pollutants from the industrial sector are the combustion of fossil fuels for heating and power, and waste gases and dust from industrial processes and sites.

Brick and cement industries are the significant air polluters in the Kathmandu valley. The number of Bull's trench kilns has increased since 1984. There were 102 Bull's kilns in 1984; that number increased up to 305 in 1993, a three times increase in 10 years. These brick industries burn coal, which produces large amounts of suspended particles, sulphur dioxide (SO_2), carbon monoxides, and other gases. It is estimated that brick industries in the valley emitted about 5180 tons of suspended particles, and 1,295 tons of PM_{10} per year (URBAIR, 1997).

The Hima Cement Factory at Chovar in the Kathmandu valley is one of the significant contributors of air pollution. Its dust emissions can be seen from any point of the valley. It is estimated that the Hima Cement Factory emitted about 2,000 tons of suspended particles, 1,295 tons of PM₁₀, and 615 tons of SO₂ (URBAIR, 1997).

Researchers have reported that suspended particles are the main air pollution problem in Kathmandu (Karmacharya & Shrestha, 1993; Devkota, 1993; NESS, 1995; Shrestha, 1994). They have found that the WHO Air Quality Guidelines for TSP and PM₁₀ are considerably exceeded both in heavy traffic and residential areas. In addition, the guideline for the annual average of TSP (60-90 µg/m³) is also exceeded (See Table 1 & 2).

Impact of Air Pollution on Health: The effects of air pollution upon wellbeing have been pervasive to add another illness to medical terminology, air pollution syndrome (APS). APS is characterised by a number of complaints induced by over exposure to air pollutants and is essentially an allergic-type reaction (Bell, Fisher, & Loomis, 1978). Several researches on the effects of air pollution in humans have been conducted both in laboratory settings and in situ. There are many kinds of air pollutants that include photochemical oxidants (smog), carbon monoxide, nitrogen oxides, sulphur oxides, and suspended particles of dust, soot, asbestos, and lead, and a number of radioactive substances. There are as many different health effects as there are pollutants. Respiratory problems are the most common, but cardiovascular problems are also linked with air pollution (Coffin & Stokinger, 1977; Goldsmith & Friberg, 1977; Lebowitz, Cassell, & McCorroll, 1972; Sterling, Phair, Poolack, Schumsky & DeGroot, 1966; Zeidberg, Prindle, & Landan, 1964). In the U. S. A., about 140,000 deaths per year are attributable to air pollution (Mendelsohn & Orcutt, 1979).

Carbon monoxide: Carbon monoxide constitutes the single largest pollutant in the urban environment. It results from incomplete combustion that is emitted primarily from motor vehicles and cigarette smoking. Studies indicate that exposures of carbon monoxides cause headache, dizziness, and nausea that are related to oxygen deprivation. In animal studies, higher dosage of carbon monoxides caused additional symptoms including alteration of cortical cellular structure, altered heart beat, vascular

diseases, impaired liver function, fetal growth retardation, and increased perinatal mortality (Coffin & Stokinger 1977; National Academy of sciences, 1977) It was found that carbon monoxide exposures are associated with low birth rate, increased perinatal mortality, increased distress in patients with cardiovascular disease and possible occurrence of cardiovascular disease (Goldsmith & Friberg, 1977, National Academy of Sciences) In Los Angeles, automobile drivers thought to be responsible for accidents showed elevated levels of carboxyhemoglobin in their blood (Goldsmith & London, 1968)

Carbon monoxide is linked with decreased attention and learning capacities (Evans & Jacobs, 1981; National Academy of Sciences, 1977). Carbon monoxide also impairs other abilities such as time judgement, reaction time, manual dexterity, and vigilance (Beard & Grandstaff, 1970, Beard & Wertheim, 1967; Breisacher, 1971; Gliner, Horvath, Drinkwater, & Sutton, 1975).). Even low levels of atmospheric air pollution can have a negative effect on mood, reaction time, ability to concentrate and psychological wellbeing (Bullinger, 1989).

Photochemical oxidants: Photosynthetic processes involving hydrocarbon and nitrogen oxide emissions from internal combustion produce photochemical oxidants. The major toxic component of oxidants is ozone. Ambient exposures of humans to ozone cause eye irritation, mouth dryness, and soreness. Levels of .5 parts per million (PPM) of ozone caused more severe reactions including nausea, headache, anorexia, pulmonary edema, and reductions in pulmonary capacity. In animal studies, more chronic and high level of exposures resulted into additional outcomes such as severe respiratory disorders, reduced host resistance to infection, premature ageing, biochemical alteration of haemoglobin (lipid peroxidation) that reflected shifts in reactivity to oxidant challenge, cardiovascular disorder, and possibly carcinogenic effects (Coffin & Stokinger, 1977; National Academy of Sciences, 1977). Epidemiological findings suggested small but significant association between ozone levels and respiratory related hospital admissions and respiratory infection rates (Goldsmith & Friberg, 1977, National Academy of Sciences, 1977).

Sulphur oxides: The major source of ambient sulphur oxides is the combustion of fossil fuels, originating basically from the combustion of coal and petroleum. Exposures of human to sulphur oxides within ambient range generally produce irritation of upper

respiratory passage, reduced mucosillary clearance, and reduced pulmonary functioning. In animal studies with greater exposures of sulphur oxides, Coffin & Stokinger (1977) found pulmonary and nasal lesion, pulmonary edema, bronchitis and pneumonia, pulmonary cancer and more severe pulmonary disorder. Epidemiological research found the association with upper respiratory tract infections, possibly bronchitis and asthma, aggravation of pre-existing respiratory diseases, decrements in pulmonary function (Goldsmith & Friberg, 1977).

Nitrogen oxides: Nitrogen oxides are commonly present in the atmosphere. The larger contributors of nitrogen oxides are fossil fuel combustion in electrical power production. Nitrogen oxides cause reduced pulmonary functioning, reduced host resistance to disease, diminished weight gain, general bronchial inflammation, and lipid peroxidation of haemoglobin (Coffin & Stokinger, 1977; National Academy of Sciences, 1977). Epidemiological studies have found association with increased respiratory illness (Goldsmith & Friberg, 1977; National Academy of Sciences, 1977).

Particulates: Solid and liquid aerosols suspended in the atmosphere are generally referred to as particulates. Particulates can absorb various chemicals including carcinogens and increase penetration and longevity in the lungs. Particulates also condense water and other vapours and augment effects of gaseous pollutants like sulphur oxides. The main particulates of concern are asbestos, lead, mercury, and several other heavy metals and halogens; there are several toxicological effects from these particulates. For example, asbestos effects include pulmonary lesions and carcinoma, and mesothelial tissue damage; from lead, gastrointestinal damage, anaemia, and impaired neural functioning; and from mercury, neural dysfunction, upper respiratory inflammation, and thyroid disturbance. Asbestos has also been related to pulmonary cancer, and lead poisoning may affect retardation and possibly hyperactivity in children (Coffin & Stokinger, 1977, Goldsmith & Friberg, 1977).

Table 1 Concentration of pollutants (First part- 24 hour averaging Time)

S N	Sampling station	Type of area	Traffic density	TSP μ/m^3	PM ₁₀ μ/m^3	SO ₂ μ/m^3	NO _x μ/m^3	CO μ/m^3	Pb μ/m^3
1	Chabahil	R/M	busy	555	127	<13.0	28	<11	0.35
2	Indrachowk	R/B	busy	194	59	<13.0	24	<11	0.21
3	Maharajgunj (Ring Road)	R	moderate	233	64	<13.0	17	<11	0.18
4	Thapathali	R/M	busy	206	74	<13.0	12	<11	0.31
5	Putalisadak	R/M	busy	267	92	<13.0	28	<11	0.37
6	Kalimati	R/M	busy	232	76	<13.0	24	<11	0.30
7	Royal Place	M	busy	182	93	<13.0	25	<11	0.53
8	Balaju	R/M	busy	465	102	<13.0	24	<11	0.23
9	Pir Hospital	R/M	busy	438	116	<13.0	36	<11	0.43
Average				308	89	6.5*	24.2	<11	0.32
WHO Standard				120	70	125	150		0.5-1.0

*=SO₂ <13 has been arbitrarily considered half of 13, i.e., 6.5. R= Residential, M= Market

Source: Karmacharya & Shrestha (1993). Air Quality Assessment in Kathmandu City
Environment and Public Health Organisation, Kathmandu

Table 2 Concentration of pollutants (First part- 9 hour averaging Time)

S N	Sampling station	Type of area	Traffic density	TSP μ/m^3	PM ₁₀ μ/m^3	SO ₂ μ/m^3	NO _x μ/m^3	CO μ/m^3	Pb μ/m^3
10	Kuleswor	R/M	Busy	2258	415	19	59	<11	0.7
11	Thamel	R/M	Busy	1978	498	<13	48	<11	1.2
12	Ason	R/M	Low	1772	281	<13	28	<11	0.5
13	Nachghar (Jamal)	R/M	Busy	1283	257	<13	32	<11	0.9
14	Kasthamandap	R/M	Moderate	1056	182	<13	17	<11	0.4
15	Kalanki	R/M	Busy	1201	239	22	40	<11	0.2
16	Sinha Durbar	(outskirts) Office Complex	Busy	789	225	20	69	<11	0.2
17	Dillibazar	R/M	Moderate	1077	240	18	30	<11	0.5
18	Swayambhu (Ring Road)	R (outskirts)	Moderate	1161	258	<13	26	<11	0.3
19	Ratna park (Bus Park)	R	Busy	1709	355	17	41	<11	0.6
20	Tripatheswar	R/M	Busy	1090	313	<13	30	<11	0.4
Average				1397	296	12.3	38	<11	0.54

*=SO₂ <13 has been arbitrarily considered half of 13, i.e., 6.5. R= Residential; M= Market

Source: Karmacharya & Shrestha (1993). Air Quality Assessment in Kathmandu City.
Environment and Public Health Organisation, Kathmandu.

Garbage

Garbage is a significant source of environmental pollution. In general, garbage includes a large number of things ranging from small pins, glassware, plastic containers, polythene bags, waste papers, ash, plant leaves, left foods and so on which are dumped over the land. All these solid wastes which are produced from household, commercial or industrial activities, may be considered as garbage. However, solid waste is defined more broadly. For example, Ramaprasad (1976) defined solid waste as unwanted or discarded materials in solid forms resulting from normal practice of the communities and it includes garbage, rubbish, street sweepings, ashes and other industrial wastes. In this study, garbage and solid waste are conceptualised as similar and used interchangeably.

Nepal's main solid waste sources are (1) domestic, (2) commercial, (3) industrial, (4) agricultural, (5) institutional, and (6) natural. Domestic waste produced by single and multi-family dwellings, and it often accounts for about 75 per cent of total waste collected (Flintoff, 1976). Domestic waste includes kitchen waste, paper and cartons, rags, some plastic, rubber, leather, bone, glass, crockery, pots, sweepings, and metals. Commercial waste is the second largest waste, which comes from a variety of sources that includes stores, tea stalls, business premises, godowns, restaurants, markets, fruit vendors, office buildings, hotels, guesthouses, print shops, and so on. Waste from these sources consist of papers, packing materials, such as cartons and plastics, waste from food preparation; crockery; hair; glass; pots, ashes; spoiled and discarded goods; and sometimes hazardous solids. Industrial waste is generated by several sources. Main sources are construction sites, demolition, debris, food processing industries, slaughterhouses, manufacturing establishments and breweries, leather industries, carpet factories, chemical plants, and tourist facilities. Industrial waste includes brickbats, stones, sand, wood, packaging materials, food wastes, hides, discarded metal, plastic, rags, bones, feathers, hazardous waste, and old machine parts. Agricultural waste is generated from dairies, chicken farms, and livestock. Schools, offices, hospitals, community halls, and religious places are the major source of institutional waste. Since temple form an important part of Nepalese life style, a substantial volume of garbage assemble everyday, which consisted of food, hair, ashes, crockery, leaves, flowers, sweepings, and offered things. The waste which hospitals and nursing homes produce

have more hazardous solids and pathogen waste. Waste from other institutions usually contains papers, boxes, plastic sheets, wrappers, and so on. Natural waste comes from trees and plants along roadsides and parks and stray animals. It includes leaves, tree branches, seeds, and carcasses of animals.

Garbage is the outcome of growing population, increasing living standard and consumerism. Because of excessive use of non-biodegradable polythene bags, papers, plastic and tin containers, and so on, volume of garbage is increasing every year. As an outcome, Kathmandu City is going to be a filthy city if an appropriate management is not introduced.

There is a strong relation between the standard of living and the amount of solid waste produced per capita per day (Lohini & Thanh, 1978, Holmes, 1984, Deelstra, Overkamp, & Koning, 1989). Low income countries (per capita income below \$360 in 1978) generate around 0.5 kg of waste per person per day, middle income countries (US \$ 360-3,500 per capita income) generate about 1.5 kg per person per day, and high income countries (per capita income higher than US \$ 3,500) generate around 2.75 to 4 kg per person per day (UNEP/UNICEF, 1990).

Solid waste in Kathmandu: Kathmandu is facing a serious problem of solid waste management for some years. Thapa (1989) reported that some 350,000 residents of Kathmandu produce about 140 tonnes of waste per day, of which about two-third by volume is deposited outside the compound of the houses. One-third is directly used by the population for composting and fuel, or kept in the courtyard where it is impossible for the solid waste collection services to reach it (GTZ & SWMRMC, 1988). Looking at the available figures a trend in the amount of waste produced is evident. Lohini and Thanh (1978) estimated that the average amount of waste generated was 0.25 kg per head per day in 1978. During the 1980s, this amount increased to about 0.40 kg per head per day (Sharma, 1985; GTZ & SWMRMC, 1988). Kathmandu currently produces an average of about 0.565 kg waste per head per day (Rai, 1990), suggesting that waste generation has more than doubled in just ten years. Thapa (1989) expected an increase of solid waste in Kathmandu of 40.4 percent from 1990 to 1995, while the population is expected to increase by 25.2 percent.

Municipality is thought to be responsible for the management of waste, but because of lack of resources it has not been possible to manage all the waste generated in the city. Kathmandu Municipality has 76 garbage bins, 200 handcarts, 29 tractor and trailers, and 958 employees to manage 140 tones of solid waste dumped in different locations (Thapa, 1989)

Traditional habits and attitudes towards waste are important factors for the management in Nepal. Traditional rural habits of throwing waste outside the house still exist in urban areas. The perception of being and feeling responsible for the waste that individual produces, are sometimes in conflict with traditional beliefs and practices. In traditional culture, only certain people, within a strict caste system, are responsible for cleaning tasks and waste disposal. For other castes, responsibility ceases once waste is placed outside the home. Yet there is evident concern and pride in having a clean personal environment. The inner space, particularly the hearth, must be kept clean while the outside space, being in the public domain, is of less concern. This "Ghar Baahar" (outside the home) syndrome inhibits efforts to create an effective public, solid waste management system. Generally, women are responsible for the household duties, disposal of household garbage close to their dwellings where it causes an unsanitary and smelly living environment.

In traditional communities of Kathmandu, **Chwaasa**, **Saaga**, and **Nauga** are terms used for waste disposal. **Chwaasa** is a dumping place outside the dwellings with religious significance, at certain places, usually at crossroads. These places (**Chwaasa**) are generally viewed as 'inauspicious'. At these places, belongings of a deceased person such as clothes, bedding, medicines, pottery, and so on are thrown in the name of the dead person's spirit. Since it is believed that evil spirit inhabits these places, people are reluctant to clean them; doing so will cause death. Such areas, thus, develop dumping sites to satisfy the spirit. Because of ritual significance, heaps of waste are growing in different places in Kathmandu.

Pit disposal on the compound is termed as **Saaga** and under the stairs inside the house on the ground floor is termed as **Nauga**. Both **Nauga** and **Saaga** are important in agrarian households. The biodegradable waste is used as compost or thrown in a **Saga** and later it is used as fertiliser. It is not this waste that causes problem for waste

management But the waste dumped outside the house on communally recognised dumps (inside the courtyard or at open places street corners or river banks) and the waste thrown on the street, totalling 63.4 per cent of all waste generated cause problems (UNEP/UNICEF, 1990)

Another factor affecting disposal and cleaning activities is the important role of waste heaps in certain religious festivals One of these festivals is “**Chakandeo Jatra**”, which takes place in March During the festival the image of Chakandeo is quietly and mysteriously carried down a narrow dark lane to a garbage-dump area where the neighbouring people present him with offerings, flowers and red Tika powder

In addition to cultural habits and attitudes towards the garbage throwing and dumping, the problem of lack of sanitation awareness is far reaching Awareness concerning the threat to living environment and health because of uncollected waste is lacking As a result, people still throw waste at random and sweepers, appointed to clean the city, sometimes throw accumulated garbage in places where no collection takes place, which hinders the management of waste

Impact of Garbage: Uncollected garbage has several negative effects on environment and health. Garbage affects the natural environment mainly by polluting land, water, and air Garbage dumps pollute land chemically and mechanically and can make it useless for agriculture, living and recreation. Landfill areas can become a problem in the future as they decompose over the decades producing toxic and flammable gases and effluents Garbage dumps also pollute both surface and ground water Drains, streams, and rivers are blocked and polluted by runoff from dumping sites and the contents diverted. Ground water is affected by seepage from decomposing waste and hazardous materials Burning of waste means spreading heavy metals, gases, and soot as smoke over residential areas The most obvious environmental damage caused by solid waste is aesthetic; the dumping of waste results in unsanitary, unsightly, and odour-producing conditions (Thapa & Ringeltaube, 1981)

Health Impact: There are potential health risks associated with the poor management of solid waste Children are particularly susceptible to respiratory problems caused by dust from disposal sites and also to skin and eye infections The major child-killing diseases

in developing countries are related to unsanitary conditions such as those associated with uncontrolled solid waste (UNEP/UNICEF, 1990)

The major risks to health are indirect. Uncollected and untreated garbage becomes the fertile breeding ground for vectors (e.g., flies, mosquitoes and cockroaches) and the attraction of rodents and stray animals, e.g., rats, and bacteria and parasites, and numerous other insects which pass on infections and diseases to humans. The recent outbreak of plague in Surat, India was due to unsanitary conditions that caused deaths to a number of people there.

Another health problem that is related to burning of garbage which contributes to air-pollution and respiratory infections, windblown dirt and dust particles from waste heaps can have the same effects (Forestry Service, 1983). Dust can contain heavy metals such as lead, mercury, cadmium, and arsenic which are harmful to human health (Sharma, 1987, Pandey, 1987). The problem of water pollution has been made worse by dumping of solid waste near the water source, which is often unrecognised or undermined. These type of neglects may cause health problems like diarrhoea, gastro-enteritis, typhoid and dysentery (Sharma, 1987).

Water Pollution

Water is one of the basic needs for human survival. That is why, water has been the most exploited natural resource since human civilisation strode the earth. On the one hand, population growth, increasing levels of living standards, industrial development, and economic activities have resulted in increasing demand of water, and on the other hand, the pollution of water resources is increasing continuously. Therefore, it is necessary to manage water resources and to control water pollution effectively for sustainable development and human welfare as well as to meet the future demands for water.

Water pollution may be defined as the deterioration in chemical, physical and biological properties of water brought about mainly by human activities or natural processes. The USA President's Science Advisory committee, (1965) defined water pollution as 'the

alteration in physical, chemical, and biological characteristics of water which may cause harmful effects on human and aquatic life '

Water pollution may be caused by many factors such as atmospheric dissolved gases, decomposition of animal and vegetable materials, weathering of soil and rock materials, industrial effluents, and sewage disposal. Obviously, human activities are more responsible than natural processes to cause water pollution. The U S Department of Health, Education, and welfare grouped the pollutants of water into eight major categories (I) sewage and waste, (II) infectious agents, (III) plant nutrition, (IV) particulates, (V) radioactive substances, (VII) heat, and (VIII) organic chemical exotics (Franke & Franke, 1975)

Water pollution is one of the major environmental quality issues in Nepal. In general, due to disposal of solid and liquid wastes on land or into surface water are the major sources of water pollution. Sewage, industrial effluents, and agricultural residues and chemicals are the most significant wastes for water pollution. Sewage primarily originates from domestic premises and along with industrial effluents, it is discharged untreated into streams and rivers, directly via the public sewerage system and indirectly through runoff and open drains. The main agricultural sources of ground and surface water pollution are pesticides, fertilisers, and livestock.

Water pollution in Kathmandu: The Nepal Water Supply Corporation is responsible for the distribution of water supply in urban areas. However, people in many areas of Kathmandu also use untreated ground water from open dugwells, tubewells, and stone spouts (locally termed as '*Dhungedhara*') for drinking, washing, and ceremonial purposes.

Coliform bacteria inhabit the intestinal tract of humans and animals. Generally, its presence in drinking water indicates faecal contamination, although not all coliforms are faecal of origin. Coliforms include all aerobic and anaerobic nonspore-forming bacilli, such as *Escherichia Coli*, *Citrobacter Freundii*, *Enterobacter Aerogens*, *Enterobacter Cloacae* and *Klasiella Pneumoniae*. The presence of Coliform microorganisms in drinking water may indicate the presence of bacterial infections that cause waterborne diarrhoea diseases. Coliform bacteria are most common bacteria globally used as

primary measures for identifying the microbiological quality of drinking water thus, are regarded as indicator organisms. Several researchers have reported that the public water supply is far from satisfactory in almost all locations in terms of bacterial contamination. Sharma (1978) studied the quality of drinking water supplied to the households of Kathmandu by performing Coliform tests on water samples from 39 localities. He found that all the water samples had some degree of faecal contamination. The number of Coliform cells per 100 ml of water ranged from 4 to 460. The most polluted water was found in Thamel, Maruhati, Gyaneshwor, and Chikanmugal areas of Kathmandu. The levels of coliform organisms present in the drinking water far exceeded the maximum permissible value of less than one cell per 100 ml of water set by the World Health Organisation (WHO, 1971, see Table 3) and posed a clear threat to human health.

In a follow-up study, Sharma (1986) found that the levels of Coliform contamination in drinking water in Kathmandu had significantly increased in nine years. In 1978, the maximum Coliform count was 460 per 100 ml, but the contamination levels reached 4,800 coliforms per 100 ml in 1986. In the 1986 study, he also examined the relation between the levels of bacterial contamination in drinking water and the seasonal variation. The bacterial count was found to be higher in the rainy season than in the dry summer and winter seasons. The Coliform bacteria count ranged 0 to 6800 during rainy season, 0 to 75 in winter, and 0 to 460 per 100 ml in summer months. In conclusion, sewage system contamination of the drinking water supply increased significantly in the rainy seasons, as water volume in the sewers increased, submerging then water supply pipelines.

Adhikari, Rai, Pokharel, & Khadka (1986) carried out Coliform tests on 100 sample of drinking water collected from different areas in the Kathmandu valley, and from different sources—from water taps, natural springs, and ponds. The study revealed that 88 percent of the water samples were unsatisfactory (more than 10 coliforms per 100 ml), six percent satisfactory (one to three coliforms in per 100ml), and only 4 percent excellent for drinking purposes (no coliforms). Most of the unsatisfactory water samples had more than 1,800 coliforms per 100 ml of water, 42 of the 48 tap-water samples, 22 of 27 spring water samples, and 24 of 25 pond samples were unsatisfactory. Environment and Public Health Organisation (ENPHO), a national NGO, and DISVI, an

Italian INGO, have conducted two extensive studies on water qualities of Kathmandu City during 1988 and 1991-1992. Water samples were collected from water treatment plants, 44 and 39 public taps during the first and second studies respectively. Both studies revealed the existence of bacterial contamination in most of sampling points (See Table 4). Both studies showed that bacteriological density increased as the water travelled from the treatment plants to the distribution system. The average value of Coliform count increased almost 20 to 50 times from treatment plants to the distribution system, while the number of samples without Coliform dropped from 77, 82 to 30, and 50 percent in the distribution system respectively. Water samples from congested areas of city had the highest level of contamination and were out of WHO standard having average density of 275 to 299 coliforms/100ml. In these areas both the vicinity are old and in poor conditions, thus, infiltration of sewage polluted water through leakage and back siphonage make the pipe water contaminated.

To fulfil the daily needs in some areas of Kathmandu City, residents are using ground water from dugwells, tubewells, and stone spouts. CEDA (1989) reported that 5 percent of population in Kathmandu regularly used water from dugwells and stone spouts. Sharma (1986) found that water from these sources were highly polluted with Coliform bacteria counts from zero to 460 per 100 ml during summer. Similarly, Vaidya and Karmaacharya (1980) concluded that no groundwater that supplied open from dugwells, tubewells, and water springs water found to be suitable for drinking purposes. Investigating bacteriological quality of groundwater in Kathmandu, ENPHO and DIVIS (1990) also found that water from spouts was faecal contaminated and confirmed that the ground water from the stone spouts is not safe for drinking.

The improper disposal of ever-increasing quantities of organic and inorganic chemicals in the municipal sewage and industrial effluents can adversely affect the chemical quality of drinking water. The drinking water supply in Kathmandu from surface is within safe limits in terms of chemical parameters (Sharma, 1986; CEDA, 1989; DISVI, 1989), but ground water sources are not satisfactory in this respect (See Table 5). Air pollutants, pesticides, and fertilisers carried to the rivers by the rain also contribute to contamination. The Bagmati and the Bishnumati rivers are considered as the most polluted rivers in Nepal. The Bagmati is the largest river in the Kathmandu valley, covering a length exceeding 30 km. Several studies on pollution of the Bagmati river

have been conducted (Shrestha, 1980; Upadhyay & Roy, 1982, Khadka, 1983, Napit, 1988, Pradhanang, Singh, & Khanal, 1988, Vaidya, Gorkhali, Kharel, & Pradhanang, 1988, DISVI, 1988; RONAST, 1988; Shrestha, 1990, and Karmacharya, 1990) DISVI (1988), in co-operation with RONAST conducted the most comprehensive study classifying the Bagmati river into distinct zones according to water quality class as determined by the Extended Biotic Index (EBI). The EBI indicates the degree of pollution of surface water using benthic invertebrates as indicators. The biotic index value of water quality is based on the known pollution tolerance of specific invertebrate species. Least polluted water is classified under class I, and most polluted as class V. Various chemicals parameters such as COD, BOD, NH, PO, NO, Cl and conductivity have also been examined to determine the river water quality with similar results using the EBI. Table 6 summarises the findings of the various water quality studies on the Bagmati river system. Studies conducted by ENPHO/DISIV during 1988 to 1992 suggest that the pollution load is increasing with time (ENPHO, 1995). Besides chemical pollution, Coliform density recorded is very high having average of 5,700MPN/100 ml to 16,900,000MPN/100ml at different points along the river. Similarly, the level of Coliform and faecal Coliform in the Bagmati, Bishnumati, and Dhobikhola rivers was found a staggering 720,000 cells/100ml in each case (CEDA, 1989, Shrestha, 1990, and Karmacharya, 1990).

In spite of such quality, water is being used for vegetable washing, irrigation, bathing etc. It is also affecting the groundwater aquifer of Kathmandu city, especially around the riversides. Unfortunately, due to lack of city water supply people living near the riverside are tapping the ground water for daily usage.

Table 3 WHO International Standard for Drinking Water

Parameters	Desirable level	Permissible level
Colour (□ Hazen)	5	50
Turbidity (Jackson Units)	5	25
Taste and Odour	Unobjectionable	-
Total Solids (mg/l)	500	1,500
pH	7-8.5	6.5-9.2
Anionic detergents (mg/l)	0.2	1.0
Mineral oil (mg/l)	0.01	0.3
Phenol (mg/l)	0.001	0.002
Total hardness (mg/as CaCO ₃)	100	500
Calcium (mg/l)	75	200
Chloride (mg/l)	200	600
Copper (mg/l)	0.05	1.5
Iron (mg/l)	0.1	1.0
Magnesium (mg/l)	30	150
Sulphate (mg/l)	200	400
Zinc (mg/l)	5.0	15
Nitrate (mg/l)	-	-
Fluoride (mg/l)	-	-
Arsenic (mg/l)	-	0.05
Cadmium (mg/l)	-	0.01
Cyanide (mg/l)	-	0.05
Lead (mg/l)	-	0.1
Mercury (mg/l)	-	0.001
Selenium (mg/l)	-	0.01

Coliform Bacteria

- 1 Coliform bacteria should not be present in 100 ml any two consecutive samples of drinking water.
- 2 No sample should contain more than 10 Coliform bacteria per 100ml,
- 3 Throughout any year, 95 percent samples should not contain any Coliform bacteria in 100 ml , and
- 4 No 100-ml samples should contain E. coli

Source WHO (1971)

Table 4 Coliform contamination in Kathmandu City Water Supply System

	Treatment Plants		Distribution Systems	
	1988 (Total Coliform test)	1991-92(Faecal Coliform test)	1988 (Total Coliform test)	1991-92 (Faecal Coliform test)
Number of samples	154	39	282	172
Minimum count/100 ml	0	0	0	0
Maximum count/100 ml	400	84	2,800	16,000
Average count/100 ml	10	4	196	231
% of samples without Coliform	77	82	30	50
% of samples with Coliform	23	18	70	50

Source. ENPHO (1995)

**Table 5
Chemical Parameters of Taps and Groundwater in Kathmandu**

	unit	Tap Water	Ground Water
Chloride	mg/l	5 to 12	610* to 1100*
Nitrate	mg/l	18 to 48	27* to 58*
Sulphate	mg/l	1 to 3	61 to 92
BOD	mg/l	1.5 to 3	2 to 12*
p ^H		6 to 8.5	6 to 8.9
Hardness salts	mg/l	10 to 35	230 to 750

*Values exceeding the WHO international standard.

Source Sharma (1986).

Table 6 Water Quality of Bagmati River System

Sample Site	Distance of Sample Site from Source	Water quality class (EBI)	Parameters Exceeding Standard	WHO
Bagamati River				
Sundarijal	7 km	I	None	
Gokarna	15 km	I	None	
Pashupatinath	20 km	II	COD, PO4	
Thapathali	25 km	III	COD, NH3, PO4 and Conductivity	
Sundarighat	28 km	V	All	
Chobhar	31 km	Fluctuates	COD, NH3, BOD	
Khokana	35 km	III	COD, NH3	
TRIBUTARIES				
Manohara River, Phulbari		II	None	
Dhobi Khola River, Baneswore		III	None	
Bishnumati River, Kalimati		V	All	

Source DISIV (1988), RONAST (1988), Shrestha (1990), and Karmaacharya (1990).

Impact of Water Pollution on Health: Pollution of drinking water is the most serious health issue in Nepal. Outbreak of epidemics and several diseases like gastro-enteritis, cholera, jaundice, dysentery, typhoid, diarrhoea, and tuberculosis are caused by polluted water. In 1985, more than 50 percent of hospital patient were found to be suffering from gastro-intestinal disorders normally caused by waterborne pathogens (ADB, 1985)

Industrial effluents and wastes that are discharged into main stream and pollute water are more harmful as they contain metals like copper, mercury, lead zinc etc., detergents, petroleum, alkalis, acids, alcohol, phenols and many other organic and inorganic toxic pollutants. These chemicals are poisonous and may cause sublethal pathology of liver, kidneys, reproductive system or nervous system in both invertebrate vertebrate aquatic animals and in some cases may cause death (Verma & Agarwal, 1994). The consumption of contaminated water that has solid minerals like asbestos causes lung cancer and stomach disease called asbestosis.

In conclusion, the environmental conditions of Kathmandu mentioned above are critical and threatening to the health and wellbeing of urban dwellers. Some of these conditions are pervasive while others occur only at home or at work or in transit. The occurrence of these situations is profoundly disturbing, and as many commentators on modern urban life claim that such conditions produce behavioural and physiological consequences that are harmful to the health and well being of man. The study of such conditions and consequences may be subsumed under the category of stress, which has been generally defined as the affective, behavioural, and physiological response to aversive stimuli (Appley & Trumbull, 1967). The perceptions of the urban environmental conditions are important factors to induce stress on individuals and are also crucial for coping behaviours. This study was aimed to investigate perception of environmental condition, stress, and coping. Thus, a brief review of research on environmental stress is presented in the following section.

Environmental Stress

The quality of an individual's life depends to a great extent on how he/she adjusts to, or cope with the psychosocial and physical demands of his/her environment. If one becomes a failure to fulfil such demands, it may cause stress that may result in impaired physical and psychological wellbeing, disease, and even death. Stress is one of the greatest threats to the quality of life, and therefore, a study of stress is a social priority as well as a legitimate issue. Psychologists in general and environmental psychologists in particular have been using the concept of stress to understand the relationship between human behaviours and the environmental conditions and how the physical surroundings are capable of interfering with optimal human functioning.

The concept of stress

The terms like stress and stressors are in popular use. However, they mean different things not only to laymen, but also to researchers. The psychologists who are concerned with stress have not neglected the preliminary need for an accurate conceptual definition (Cofer & Appley, 1964, Appley & Trumbull, 1967, McGrath, 1970). Generally, stress is defined as a response or stimulus, or a process of imbalance between person and environment.

Response based definition of stress: Response based definitions of stress focus on the specification of particular response or pattern of responses, which may be taken as evidence that the person is, or has been, under pressure from a disturbing environment. That response or pattern of responses is either actually treated as the stress, or at least, is treated as its defining parameters. Thus, occurrence of response syndromes represents the simultaneous occurrence of stress. Here, stress is treated as dependent variable, as the response to stressor. According to Selye (1956), "stress is the non-specific (physiological) response of the body to any demand made upon it." He saw stress quite univocally as the person's (or animals) response to the demands of his environment.

Response based definition has been objected by several stress researchers (Appley & Trumbull, 1967, McGrath, 1970, Mason, 1975) Such definitions of stress are often insensitive to critical temporal parameters in stress since the duration and periodicity of stressors have important impact on human health and well being Again, response based definitions ignore the fact that highly variables situations (e g , negative, positive and ambiguous) can lead to similar response outcomes For example, exercise as well as threat of personal injury heightens blood pressure. It is not easy to understand stress by strictly focusing on response outcomes only because other factors such as cultural norms, or the resources provided by other people may all mediate response to stressors (Kaplan, 1983; Levine & Scotch, 1970, Mechanic, 1978b, Perlin, 1982) It is also difficult to isolate a set of responses that invariably occur when adaptive resources are taxed (Lacey, 1967, Mason, 1975)

Stimulus based definitions of stress: Stimulus based definitions describe and treat stress in terms of the stimulus characteristics of environments which are recognised as disturbing or disruptive in some way Stimulus based approach treats stress, as an independent variable for study and demands consideration of what stimuli are diagnostic of the stress

Stimulus based definitions of stress are criticised because there are large numbers of variations in individual responses to the same situation. Also, there are variations across persons on past history, threat appraisal and coping styles (Appley & Trumbull, 1967, Lazarus, 1966,1970, McGrath, 1970; Mason, 1975).

Interactional definitions of stress: Stress researchers both inside and outside the environmental psychology have adopted more relational and interactional view of stress The interactional approach to stress expresses the view that stress arises through the existence of a particular relationship between person and his environment. According to this view stress is an individual perceptual phenomenon rooted in psychological processes Stress is a process that occurs when there is an imbalance between environmental demands and response capabilities of the organism (Lazarus, 1966, Lazarus & Launier, 1978; McGrath, 1970) According to this view, stress occurs when one evaluates that environmental stimuli are likely to tax or exceed one's personal capabilities Recent books and reviews of environmental stress show that environmental

psychologists have accepted the interaction perspective. They emphasise that stress is fundamentally a relational concept signifying an imbalance between environmental opportunities and individual's goals and capabilities to cope with that imbalance (Baum, Singer & Baum, 1982, Caplan, 1982; Carson & Driver, 1970, Evans, 1982, French, Rodgers, & Cobb, 1974, Lazarus & Cohen, 1977; McGrath, 1970, Stokols, 1979)

Several researchers have argued that stress cannot be reduced into separate personal and environmental components (Lazarus, DeLongis, Folkman, & Gruen, 1985, McGrath, 1970, Stokols, 1979) and it is inherently a relational construct like most other psychological constructs (Magnusson, 1981). More broadly, Evans and Cohen (1987) have defined, "stress is best considered as a complex rubric reflecting a dynamic, recursive relationship between environmental demands, individual and social resources to cope with those demands, and the individual's appraisal of that relationship"(p. 573). In stress research, investigators have more focused on individual and societal resources that impact on coping abilities plus personal appraisals of threats than physical environment that may be likely to place adaptive demands on the organism (Dubos, 1965, Evans, 1982). Physical environment is equally important because a major source of information about stressors and various coping opportunities lies within the configuration of the physical environment.

Sources of stress

Generally, Four types of environmental stressors have been classified: cataclysmic events, stressful life events, daily hassles, and ambient stressors (Baum, Singer, & Baum, 1982; Campbell, 1983, Evans & Cohen, 1987; Lazarus & Cohen, 1977)

1. Cataclysmic Events: Cataclysmic events are sudden, unique, and powerful single event or cluster of related occurrences affecting large number of people. Cataclysmic events are catastrophes that demand major adaptive responses from all individuals directly affected by the event. Natural disasters (Baker & Chapman, 1962) as well as technological accidents fall within this category of events. Floods, earthquakes, volcanic eruptions, major storms, nuclear plant accidents, and discoveries of toxic waste dumps are examples of cataclysmic events.

2. Stressful life events: The second category of stressor include those powerful events in the lives of people that challenge adaptive abilities in the same way as cataclysmic events, but affect fewer people and typically require personal or social adaptive responses. Life events include such things as major changes in family status (e.g., divorce, marriage, birth, death), and in economic conditions (e.g., gain or loss of job, change in job position, change in educational status). Those life events that are uncontrollable, undesirable, or unscheduled in the life cycle such as death of loved one, big loss in business and like others, are more likely to cause harmful outcomes (Dohrenwend & Dohrenwend, 1974; Perlin, 1982; Rabkin & Struening, 1976; Thoits, 1983; Wheaton, 1983).

3. Daily Hassles: Daily hassles refer to those stable and repetitive problems encountered in daily life that typically do not present great adaptive difficulty. They are ordinary daily life events that may cause frustration, tension, or irritation and are more common and short lived than most life events. Daily hassles include environmental events such as noisy party, crowded bus, crowded elevator, interpersonal problems, e.g., with friends, family members or work issues such as arguments with co-worker, deadline (DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982; Kanner, Coyne, Schaefer, & Lazarus, 1981). Some hassles are more chronic that includes job dissatisfaction (Kahn & French, 1970, Frankenhaeuser & Gardell, 1976), neighbourhood problems (Harburg, Erfrut, Chapert, Nauestein, Schull, & Schock, 1973), and commuting (Singer, Lundburg & Frankenhaeuser, 1978). The relationship of health with daily hassles (e.g., rising price of commodity, salary reduction, lack of money, strenuous job conditions), chronic social and environmental stressors was found to be positive in Indian slums (Lepore, Evans, Palsane, 1991, Lepore, Palsane, & Evans, 1991).

4. Ambient Stressors: Ambient stressors are those conditions of the physical environment which are more continuous, relatively stable and intractable (Campbell, 1983). Many ambient stressors are background conditions, passing largely unnoticed unless they interfere with some important goals or directly threaten health. For example, people who live in such places where they have to face chronic air pollution are likely to get habituated to these environmental conditions.

Dimensions of Environmental Stressors

Evans and Cohen (1987) have outlined eight dimensions along which environmental stressors vary perceptual salience, type of adjustment required, the value or valence of events, degree of controllability, predictability, necessity and importance, and tied to human behaviour, and duration and periodicity

Perceptual salience: Stressors vary in the degree to which they are perceptually salient or easily identifiable or noticeable (Baum, Singer & Baum, 1982, Campbell, 1983; Wohlwill, 1974) If physical source of stress are chronic, low-moderate intensity and uncontrollable, they become background stimuli Habituation in response sensitivity as well as general awareness is a by-product of chronic exposure to many low-level ambient stimuli (Glass & Singer, 1972; Wohlwill, 1974, Sonnenfeld, 1967)

The type of adjustment required: Different types of environmental conditions require different types of adjustments Very intense or uncontrollable environmental conditions are likely to lead to accommodation and emotion-focused coping rather efforts to deal with the stressors directly (Kiretz & Moos, 1974, Lazarus & Cohen, 1977)

The value or valence of events: Whether one experiences gains or losses from the events that may be important consequences for reactions to the stress. Some source of environmental stress may be positively valued (e.g., marriage, new job, birth of child) even though they demand major adaptive resources while others may have negative values (e.g., loss of job, divorce) and require more adaptive resources The physiological and the psychological approaches differ in this dimension for characterising stressors The physiological view emphasises the disruption of equilibrium and consequential adaptive efforts to restore homeostasis while the psychological view acknowledging the importance of adaptive demands asserts that negative value of the threat to equilibrium is also crucial.

Degree of controllability: Environmental stressors can be distinguished in terms of controllability. Control can function as a psychological (appraisal) process that is influenced by individual disposition, e.g., locus of control, or personal coping

resources. Control, in this situation, is viewed as an intra-moderator of stress. Control also can refer to instrumental opportunities to exercise influence over the occurrence or duration of an environmental event. In this sense, control refers to a characteristic of a situational variable. Uncontrolled stressors are typically appraised as more threatening, at least initially, and are frequently associated with negative effects on health and behaviour (Baum, Singer & Baum, 1982; Cohen, 1980; Glass & Singer, 1972). If a stressor remains uncontrollable and chronic, it is more likely to become an unnoticed background characteristic due to habituation (Campbell, 1983). When an aversive situation cannot be modified or eliminated, one has little option available other than some form of denial or reappraisal of the stressor (Folkman & Lazarus, 1980; Perlin & Schooler, 1978; White, 1974).

- **Predictability:** Some environmental stressors are more predictable in the sense that they are more regular in their occurrences than some others. These predictable stressors can have consequences for both, the way they influence our health and the manner in which we may choose to cope with them.
- **Necessity and importance:** Environmental stressors vary in the perception of individuals. Those environmental stressors which are perceived as necessary and/or important (e.g., military aircraft versus pleasure flying) cause different kinds of reactions.
- **Tied to human behaviour:** If the source of a stressor is tied to human behaviour, it may have different kinds of reactions. For example, air pollution and heat do not fit in the same pattern of stress effects that crowding and noise do. People view air pollution and heat either as natural phenomena or caused by other societal entities (e.g., industries) rather than caused by the behaviour of individuals. Personal responsibility cannot be fixed for heat. This may have consequences for the way in which these environmental conditions are appraised and coped with.
- **Duration and periodicity:** Duration and periodicity are the important characteristics of environmental stressors. Duration has two dimensions: The extent of previous history with the stressor and length of current exposure to the condition. Periodicity refers to regularity of stressors as well as its continuity. Some stressors are more

discrete (e.g. life events) whereas others are more continuous (e.g., air pollution). Adaptation processes may be strongly affected by both duration and periodicity.

Models of Stress

There are several models that psychologists have adopted for understanding the process and consequences of stress. Research in environmental stress, in general, falls within one of the two traditions: the physiological tradition and the psychological tradition. Evans and Cohen (1987) view that these two theoretical paradigms are not necessarily contradictory, but rather focus on somewhat different dimensions of the stress process.

The physiological model

Walter Cannon (1932) and Hans Selye (1956, 1975), two of the pioneer researchers on stress, developed physiological models of stress that centred on the sympathetic nervous system and the pituitary-adrenocortical axis, respectively. Both researchers emphasised that the body responds to aversive conditions or noxious stimuli (stressors) to achieve homeostatic balance because these stressors disrupt some internal equilibrium.

According to Cannon (1932), the body has an autonomic, emergency response system allowing the organism to fight or flee from any serious, aversive or challenging situation. Stress is a direct strain on the homeostatic mechanism of the body. In addition to the fluctuation on the external environment, homeostasis reflects the necessity of maintaining the internal composition of the body within some limits. The sympathetic nervous system acts directly on the adrenal medulla to secrete catecholamines including adrenaline. These substances in turn heighten response for dealing with the emergency at hand by increasing metabolism of carbohydrates to produce more glucose and the releasing of fatty acids for greater energy, higher heart rate and oxygen consumption, and constriction of blood flow to peripheral areas of the body with greater blood supply to the skeletal muscles, kidneys, and brain. Cannon argued that, on the one hand, the fight-flight response had adaptive value because it would enable the organism to respond quickly to the threat. On the other hand, stress could be harmful to the organism.

because it would hamper physiological functioning of the organism, and prolonged exposure to stress would lead to health problems.

After Cannon, many scholars have raised the interesting dilemma whether the stress and strain of modern, urbanised civilisation are particularly harmful because of distinctiveness from the type of environmental setting under which we evolved as a species (Boyden, 1970, Dubos, 1965, Esser, 1974, Kaplan & Kaplan, 1982) Our social and physical environments have altered a lot and are demanding. It is difficult to assess the importance of modernisation. However, we know that chronically increased levels of circulating catecholamines have direct links to cardiovascular diseases causing fibrin formation in arterial walls, platelet aggregation, hemodynamic effects like increased blood pressure, ventricular arrhythmia, and uptake in oxygen requirements of the heart (Krantz & Manuck, 1984; Steptoe, 1981)

Selye (1956, 1976) provided the systematic treatment of stress that was based on a triad of physiological responses that accompanied physiological challenge. According to Selye, various psychological and physiological insults elicit both specific effects as well as non-specific physiological reactions. Selye calls these non-specific effects the General Adaptation Syndrome (GAS). GAS is based on the idea that the body can cope with stress but this coping has costs for consequent coping. Long term exposures to a stressor or repeated instances of adaptive demand can deplete the body's adaptive reserves and lead to physical dysfunction. GAS has three stages: alarm, resistance, and exhaustion. In the alarm phase, when first exposed to a stressor, the body reacts to it by mobilising its coping abilities. During this phase, the pituitary gland secretes various chemicals including adrenocorticotrophic hormone (ACTH), which stimulates the adrenal cortex to produce various substances including a group of anti-inflammatory hormones called corticosteroids. These alarm reactions represent preparation for resistance. As these reserves are made ready, the body enters a stage of resistance, applying various coping mechanisms and typically achieving suitable adaptation. In resistance phase, increase in these steroids set-up a feedback loop stimulating adrenal medulla activity and subsequent release of catecholamines. When these reactions are repeated often, or when coping is not successful, however, adaptive reserves are depleted, and the organism enters a stage of exhaustion. During exhaustion, the adrenal glands are

unresponsive to environmental demands with various susceptible organs suffering break down or damage

Evans and Cohen (1987) have pointed out three specific implications of physiological model of stress

1. Various environmental pathogens as well as social-psychological strains will cause non-specific responses known as General Adaptive Syndrome. This implies that stress may be additive. Responses to a specific stressor will be influenced by both the severity of the specific event and by the severity of other threatening events (Fleming, Baum & Singer, 1984)
2. In the processes of adaptation to the stressors, some costs or pathological effects can occur. In addition to the effects of catecholamines on the cardiovascular system, there is emerging evidence for enhanced susceptibility to infectious diseases due to interference with the immune system by corticosteroids (Ader, 1981, Krantz, Grumberg & Baum, 1985; Jemmott & Locke, 1984; Moss, 1973).
3. The body has finite amount of adaptive energy. When the capacity of the body exceeded, some deleterious effects occur (Cohen, Evans, Stokols & Kantz, 1986, Glass & Singer, 1972).

Selye's model of stress has been criticised on several grounds. First, Selye's model assigns a very limited role to psychological factors, but researchers now believed that the psychological appraisal of events is important and necessary condition in the determination of stress (Lazarus & Folkman, 1984a). Second, there is some evidence that the initial stimulation of the pituitary is from the hypothalamus but it is less clear how it is directly involved. It is found that the pituitary-adrenal sequence is triggered only when the person perceives threat or psychological harm (Mason, 1975; Mason, Masher, Moughey, Perlow, & Jones, 1976). Third, the assumption that responses to stress are non-specific or uniform has been challenged. There is evidence that particular stressors produce unique patterns of different psychoendocrine responses (Appley & Trumbull, 1986, Hobfoll, 1989, Mason, 1974; 1975; Mason et al., 1976). The increasing evidences suggest that the kind of coping processes engaged in can also influence physiological

responses to stress. Efforts to maintain optimum task performance during stress causes a physiological profile distinct from stressor exposure where little or no coping efforts are made to maintain performance (Frankenhaeuser, 1980, Lundberg, 1978, Obrist, Gaebelin, Teller, Langer, Grignolo, Light, & McCubbin, 1978; Manuck, Harvey, Lechleiter, & Neal, 1978). Lacey (1967) also found that the kinds of cognitive tasks one is engaged in during stressor exposure could influence physiological outcomes. A fourth criticism concerns the fact that Selye assessed stress as an outcome, such that stress was evident only when the GAS was in effect. In this respect, the model confounds the experiences of stress with its outcomes (Hobfoll, 1989). Despite these limitations and reservations, Selye's model remains today a corner stone of the field of stress.

The psychological model

The psychological model of stress focuses on the individual's interpretation of the meaning of environment events plus an appraisal of personal coping resources (Lazarus, 1966). When an individual confronts a stressor, he/she engages in a process of evaluation of the stressor, primary appraisal is the term used to describe this process. Stressors are assessed for potential threat-anticipated harm, harm/loss that has already occurred, or challenge--threat that can be dealt with. Primary appraisal of stressors depends on personal factors such as belief about self-efficacy, or mastery, the centrality of goals/needs threatened by the stressor, and various dispositional factors, and situational variables like the imminence of harm, the magnitude of stressor, the ambiguity of the stressor, the duration of stressor, and potential controllability of the stressor.

Once primary appraisal of the stressor has occurred, secondary appraisal processes come into play. During secondary appraisal processes, one assesses his/her coping abilities and resources, and whether or not they will be sufficient to meet the harm, threat, or challenge of the event (Lazarus & Folkman, 1984ab). A person's coping resources are not usually not constant over time, that is, they are likely to expand or contract as a function of experience, degree of stress, time of life, and the requirements of adaptation associated with different life styles or periods in the life course. Coping resources can be drawn from within the person or from the environment. Folkman, Schaefer, and Lazarus (1979) have discussed five categories of coping resources

1. **Health/energy/morale:** These are the most obvious coping resources. If a person is weak, sick, tired, or otherwise exhausted, there is less energy to expend on coping than in the case of a healthy, robust person. It is an enduring problem in a stressful transaction demanding extreme mobilisation. The same crisis that a healthy person survives may destroy the weak.
2. **Problem solving skills:** These include the capability to search for information, to analyse situations for the purpose of identifying the problem, to generate alternative course of action, to weigh alternatives with respect to desired or anticipated outcomes and to select and implement an appropriate plan for action (Janis, 1974, Janis & Mann, 1977). Education or training may provide greater opportunity for individuals to develop, enhance such skills and utilise in trouble situations.
3. **Social network:** Social support system can be regarded as an extremely valuable and potential coping resource. Social support refers to the functions performed for the individual by significant others, such as family members, friends, and co-workers. They can provide instrumental, informational and/or emotional assistance (House & Khan, 1985). Several researchers have reported that social support is directly and positively related to better mental and physical health (Berkman, 1984, Cohen & Wills, 1985, House, Landis, & Umberson, 1988; Kessler & McLeod, 1985).
4. **Utilitarian resources:** Resources such as money, tool, instrumental manual, special training programmes, social agencies are available to some and restricted to others. These utilitarian resources highly increase the coping options available to a person in any stressful transaction and make it possible for a person to cope more efficiently in many types of stressful situations. That is why, socio-economic status is considered as an important factor in stress. Socio-economic status is correlated positively with positive adaptational outcome, including health, morale, and social functioning (Syme & Berkman, 1976).
5. **General and specific beliefs:** The beliefs in self-efficacy (Bandura, 1977) and locus of control (Rotter, 1966, Lefcourt, 1976) have been emphasised as a general overarching resource that is critical in coping. Individual who believe that they can control or master most demands and threats by doing what is needed or by discovering what to do it are less likely to be threatened or feel helpless in stressful transactions. On the other hand, to disbelieve one's own efficacy may generate passivity and disengagement, and at its extreme may be associated with a sense of

helplessness and hopelessness, which are in turn linked to psychological disorders (Engel, 1962, Schmale & Iker, 1966, Seligman, 1975, Lefcourt, 1976)

Ultimately, subjective experience of stress is a balance between primary and secondary appraisals. When harm, threat, and challenge are high and coping ability and resources are low, substantial stress will be felt; when coping ability and resources are high stress may be minimal.

Evans and Cohen (1987) have highlighted three important implications of the psychological perspective are

1. The individual's perception of environmental demands and personal resource is critical in determining the nature of the stress response.
2. Stressful situations are not uniformly aversive. Important personal and social mediators can ameliorate or enhance the effects of stressors.
3. Stressors will affect the individual in host of ways in addition to the physiological impacts emphasised by Cannon and Selye. These impacts will include self-reports of stress and related symptoms (e.g., nervousness, tension, and anxiety), negative affects, interpersonal behaviours, and deficits in task performance.

Other models

In addition to these two models, several less encompassing models, following primarily psychological tradition, have developed to explain what is/are the mechanism(s) or process(es) that make certain environmental conditions stressful. These models have significantly influenced the environmental stress research. These models describe the nature of properties of the environment and individual that lead to stress response as well as the relationship between environmental stressors and a specific type of outcomes.

The arousal or information overload models: Arousal is a behaviour continuum ranging from sleep to high excitement. Persons usually perform optimally under, and prefer moderate levels of alertness. Low arousal levels make one sluggish and

inattentive whereas too much arousal makes it difficult to concentrate and control one's activities well. In increased arousal condition, elevated catecholamines, skin conductance, and blood pressure as well as self-report of resents, nervousness, tension and anxiety have been found.

The concept of environmental stimulation has been the most common explanation of environmental stressors. The stimulus level theory suggests that stress can result from either too little stimulation as documented by studies of sensory deprivation (Goldberger, 1982, Lilly, 1977, Riesen, 1975, Suedfeld, 1981, Zubek, 1969) and social isolation (Haggard, 1973, Suedfeld, 1974), or from too much stimulation, such as produced by noise (Broadbent, 1978, Cohen & Weinstein, 1981; Glass & Singer, 1972, Jones, Chapman, & Auburn, 1981 Kryter, 1970), Crowding (D'Atri, 1975, Epstein, 1981, Evans, 1979, Sundstrom, 1978), high temperature (Bell, 1981; Griffitt & Veitch, 1971, Wikinson, Fox, Goldsmith, Hampton, & Lewis, 1964) and air pollution (Evans & Jacobs, 1981, Lave & Seskin, 1970). Research findings suggest that for each individual there is an optimal level of stimulation, that maximises human task performance, cognitive functioning, developmental growth, physiological health, and aesthetic pleasure (Berlyne, 1960, Fiske & Maddi, 1961; Wohlwill, 1974).

A review of literature reveals that knowing the particular levels of stimulation is not sufficient to predict whether or not that stimulus will produce stress for any given individual. Researchers have found that high noise levels are associated with lowered task performance (Boggs & Simons, 1968; Bronzcraft & McCarthy, 1975; Cohen, Glass, & Singer, 1973; Hockey, 1970, Nagar & Pandey, 1987), reduced helping behaviour (Mathews & Cannon, 1975; Page, 1977), and various health problems such as nervousness, sleep difficulties, and headaches (Kokokusha, 1973), increased blood pressure (Parvizpoor, 1976), elevated cholesterol levels (Khomulo, Rodinova, Rusinova, 1976), and cardiac arrest (Capellini & Morini, 1974). However, other investigators (Gattoni & Tarnopolsky, 1973; Stevens, 1972) did not find significant correlations.

Similarly, in the majority of crowding studies, investigators have found the effects of high concentrations of people to be associated with one or more measures of physiological arousal (Aiello, Epstein, & Karlin, 1975; D' Atri, 1975; Saegert, 1975), social withdrawal (Bickman, Teger, Gabriele, McLaughlin, Beger, & Sunday, 1973; Hutt & Vaizey, 1966,

inattentive whereas too much arousal makes it difficult to concentrate and control one's activities well. In increased arousal condition, elevated catecholamines, skin conductance, and blood pressure as well as self-report of resents, nervousness, tension and anxiety have been found.

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Jain, 1987, Valins & Baum, 1973), and various physical, psychological, and social pathologies (Dean, Pugh, & Gunderson, 1975, Levy & Herzog, 1975; McCain, Cox, & Paulus, 1976, Schmitt, 1966) However, other investigators have found no such density effects (Freeman, Klevansky, & Ehrlich, 1971; Schmitt, 1963, Stokols, Rall, Pinner, & Schopler, 1973, Winsborough, 1965) These contradictory findings have led many to suggest that the interactions of various physical, social, and individual factors with environmental stimulation are important to induce stress. Thus, it is necessary to distinguish between the objective level of physical stimulation of potential stressor that is impinging upon the individual and individual's subjective psychological experience of that stimulation (Cohen & Weinstein, 1981; Kryter, 1970, Rapoport, 1975, Saegert, 1978, Stokols, 1972) Individual's perception and experience depend upon other characteristics of the stimulation situation, as well as upon characteristics of the individual, the social system, and the setting (Lazarus, 1966; Rapoport, 1975, Stokols et al, 1973)

Arousal and information overloads are the two principal underlying mechanisms of the inverted U-shaped function. According to arousal model, there is inverted U-shaped function between physical stimulus levels and human affect, performance and health Research shows that human performance under higher stresses levels produce particular patterns of deficits. Little or no effects of short-term stressors are noted for simple task, but decrements are apparent on complex performance tasks (Broadbent, 1971; Evans, 1979; Glass & Singer, 1972; Hockey, 1979, Kahanema, 1973, Keele, 1973, Nagar & Pandey, 1987, Nagar, Pandey, & Paulus, 1988, Paulus, 1980; Sherrod, 1974) The explanation of decrements of performance on complex tasks under stress is that overarousal produces a narrowing of the attention to more of cues per unit time that must be attended to (e.g , multiple signal tasks, rapid frequency signal), this narrowing of attention causes errors because some relevant cues are missed. On the other hand, simple tasks have fewer task relevant cues per unit of time and thus are less affected by attention narrowing (Easterbook, 1959, Hockey, 1970; Kahneman, 1973) Alternatively, the decreased performance on complex task under stress may be understood in terms of demands on information processing capacity. The cognitive demands of the task along with the demands to monitor a stressor may exceed the limits of an individual's information processing capacity When overload occurs, available resources will be directed toward the most relevant aspects of the task Simmel (1950) and Milgram

(1970) argued similarly, while analysing the urban residents' adaptation to the high stimulation of the city setting that people deal with overload by either eliminating or filtering low priority inputs.

The information overload model explains that uncontrollable and/or unpredictable stressors are difficult to monitor and thus place greater demands on information capacity and produce greater stress. Ambient stimuli not only produce arousal but also demand some cognitive responses from the receiver (Saegert, 1973, 1978, 1981, Suedfeld, 1979, 1980, Wohlwill, 1974). The overload model also explains that after-effects are residues of cognitive fatigue, reflecting some of the cost of trying to operate at or above maximum cognitive capacity. Physical variables, such as the intensity of stimulation, the complexity or variety of stimulation, novelty, ambiguity, conflict or inconsistent source of information and instability or change, are related to stimulation overload (Berlyne, 1960, 1971, Fisk & Maddi, 1961; Mehrabian & Russell, 1974; Wohlwill, 1974). In addition to these properties, patterns of stimulation as influenced by multiple features that are repetitive or expressive of some underlying theme or symbolic meaning may contribute to an over all sense of coherence and thus reduce information levels (Kaplan & Kaplan, 1982, Lynch, 1960). According to Scott and Howard (1970), physical factors as well as socio-cultural variables (e.g., multiple roles, work demands) can also produce stimulation overload.

Models of adaptation and coping: Adaptation and coping models emphasise the psychological aspects of human adaptive capabilities for understanding environmental stressors. It is assumed that human beings have a broad and flexible repertoire of coping resources that allow them to maintain equilibrium in the face of a broad array of environmental conditions. Human beings have been accommodating with their surroundings paying some costs for the adaptation since the evolution. The present physical environment is drastically different from the environments that human beings first evolved in (Boyden, 1970; Dubos, 1965; Iltis, Locks, & Andrews, 1970, Kaplan & Kaplan, 1982).

The assumption of adaptation model is that the goal of biological and psychological survival motivates behaviour. The biological and psychological individual attempts to

cope with threats, to meet basic biological needs, and to restore and expand capabilities for coping and flourishing (Saegert & Winkel, 1990)

Adaptation refers to a response or structural change in organism brought about by disturbances to internal or organism-environment equilibrium. Adaptation responses or changes are grouped into those that are relevant to evolution and survival of the species, and those that aid the individual organism to survive and function in his particular environment. Still another distinction is made between adaptive responses that maintain internal and external (organism-environment) equilibria. In both cases, adaptation may be achieved through automatic mechanism (e.g., the restoration of bodily temperature by evaporation of perspiration), or through cognitive and behavioural mechanisms (e.g., turning on air conditioning to aid in temperature regulation).

The exposure of environmental stressor affects on the individual's cognitive and behavioural responses that maintain organism-environment relationship. If we follow Lazarus (1966, 1968) description of coping processes, these responses may involve mobilisation of actions against the threatening stimulus, and/or the subsequent or defensive revaluation of the stimulus as benign. In either case, the subsequent occurrence of the stimulus will elicit a seriously diminished stress response. Then, an index of adaptation is the organism's decreased response sensitivity following repeated exposure to aversive stimuli.

The term adaptation is synonymously used with the term habituation. Reviewing the earlier literature, Harris (1943) defined the habituation as the "response decrement as a result of repeated stimulation". Later others have proposed the similar definitions of habituation. For example, Mackworth (1969) defined it as the "decrease in an innate response as a result of repetition of the stimulation". According to Thomas and Spencer (1966), habituation refers to the same phenomena, as does the adaptation.

Although there is general agreement on the definition of adaptation, theorists differ in the explanation of the phenomenon. Thompson and Spencer (1966) and Groves and Thompson (1970) presented the neurological approach that adaptation of hind limb reflex involves the same neural processes as more complex adaptation in the intact

organism. While others present a cognitive view (Lazarus, 1966) Lazarus (1968) describes the following underlying adaptation processes to the stressful event

"Consider a stimulus which, because it is appraised as threatening, results in a negatively toned emotional state. If this stimulation, on repetition, gradually loses its capacity to arouse an emotional response, this must mean theoretically that it has been appraised as less harmful and, hence, less demanding of coping action. The organism has presumably 'discovered' through repeated presentation of the emotional stimulus that it is less dangerous than previously assumed (p. 219)".

Lazarus (1968) proposes that adaptation to stressful events is analogous to the process whereby the orienting response adapts (Sokolov, 1958). The orienting action occurs because the organism is not certain about the adaptive significance of a neutral stimulus, and he responds with attention and alertness. The reactions disappear upon successive occurrences of the stimulus because uncertainty is reduced and the stimulus no longer requires attention. In the case of stressful stimuli, initial reactivity diminishes on successive presentation because the threat is reduced through cognitive appraisals or active coping responses.

According to adaptation level theory, either immediate or previous exposure to a high intensity of that physical stimulus will be lowered relative to judgements by others without exposure of that dimension of physical stimuli (Helson, 1964; Wohlwill, 1974). Wohlwill and Kohn (1976) and Evans, Jacobs, & Frager, (1982) have reported that individuals who have resided in an area with poor visual air quality habituate to poorer visibility. Glass and Singer (1972) and Cohen (1978; 1980) have looked at the issue of adaptation at a more individual level and suggested that a cumulative cost of adapting to stress may be cognitive fatigue.

Coping with stressors: Coping is the process of managing demands (external or internal) that are appraised as taxing or exceeding the coping resources of the person (Lazarus & Folkman, 1984ab). Coping consists of efforts, both action-oriented and intrapsychic, to manage (that is, to master, tolerate, reduce, minimise) environmental and internal demands and conflicts among them (Cohen, 1987; Cohen & Lazarus, 1979; Lazarus & Launier, 1978). Coping processes can generally be divided into problem

focused or emotion focused copings Problem focused coping strategies involve changes in the situation to reduce aversive impact whereas emotion focused coping strategies alter individual's responses In other words, problem focused coping efforts are attempts to do something constructive about the stressful condition Emotion focused coping involves efforts to regulate the emotional consequences of the stressful event

The ways in which the person copes with stressful events and whether or not his/her coping efforts are successful in reducing stress are important for his/her health and well being The fact that individuals vary in the degree of stress experienced from the same stressful events and same individual may experience different degree of stress from the same stressful events in different situations has made the stress research more complex This variability in the stress experience is due to many factors that moderate the impacts of stressors

It requires a lot of efforts to cope with stressors, especially uncontrollable ones Negative after effects in frustration tolerance or cognitive performance after exposing to crowding, noise, or air pollution are examples of the cumulative effects of efforts expended to cope with environmental stressors. Again, commutative fatigue may also affect the capacity of coping with subsequent environmental demands (Frankenhaeuser & Lundberg, 1977, Evans, Jacobs, Dooley, & Catalano, 1987)

Another result of coping with stressors may be overgeneralization when a strategy that has been developed to cope with a stressor becomes a characteristic operating mode for the individual even when the stressor is no longer present As Milgram (1970) have argued that urbanites adapt a coping strategy to block or filter low priority information associated with city living and generalises this strategy in other situations. For example, lack of attention to assist people in need (e.g., beggars, and crime victims).

Cohen, Evans, Krantz, & Stokols, D. (1980) have demonstrated that individuals cope with noisy settings by turning out auditory stimuli. However, this turning out process becomes indiscriminate and includes both speech irrelevant and speech relevant sounds As consequence, persons develop poorer discrimination ability that has been associated with difficulties in the acquisition of reading skills (Cohen & Weinstein, 1982)

Baum and Paulus (1987) and Epstein & Karlin (1975) have documented overgeneralization of responses to crowding as greater social withdrawal from stranger in uncrowded, interactive laboratory task.

Coping responses themselves may have direct physiological effects. Palliative coping such as smoking or consuming drug may reduce stress but it has health costs of its own. Cardiovascular activities greatly increase during the efforts to maintain task performance in stress or to assert control over an aversive event. If organism does not get the relevant feedback of coping efforts, more physiological activities result. In the situation of prolonged activities of such efforts can lead to ulcers and other damages (Cohen, Evans, Stokols, & Krantz, 1986). Chronic adaptive efforts may lead to diseases, either directly as in the case of greater cardiovascular activity or more indirectly, such as by reduced immunological defences to infections.

Control: Human beings have a strong need for environmental mastery and a sense of self-efficacy (Averill, 1973; White, 1959). Lack of control may lead to several negative consequences like negative affects, cognitive deficits, reduced motivation to behave instrumentally when the option is available (Seligman, 1975). Actual or perceived control over a stressor leads to fewer negative consequences than exposure to uncontrollable stressors (Averill, 1973), particularly, when the individual believes that control has the potential to modify his/her experience of the stressor.

Researchers on environmental stressors have consistently found that unpredictable or uncontrollable stressors cause greater stress in human beings. Studies on crowding (see Baum & Paulus, 1987; Epstein, 1982), noise (Cohen & Weinstein, 1981), air pollution (Evans & Jacobs, 1982), and heat (Bell & Greene, 1982) have been documented complete or partial amelioration of many negative impacts of exposures to these environmental stressors with the provision of instrumental control over the stressor. There is considerable evidence that chronic exposure to environmental stressors that are uncontrollable may produce greater susceptibility of learned helplessness. If individual is unable to predict or assert control over the environmental source of stress, he/she may learn that he/she has little ability to influence the environmental outcomes by his/her own behaviours. Thus, if coping efforts fails to modify an environmental source of stress. It is possible that an individual may

experience some helplessness. Research shows that persons who live in crowded or noisy settings are more susceptible to learned helplessness (Rodin, 1970; Cohen, Evans, Krantz, & Stokols, 1980; Cohen, Evans, Krantz, Stokols, & Kelly, 1981; Cohen, Evans, Stokols, & Krantz, 1986). Studies on after-effects from noise, crowding, and air pollution also suggest evidence of helplessness. Cohen (1980) found that persons who were exposed to uncontrollable sources of environmental stress were less persistent on cognitive tasks that required frustration tolerance. Negative after-effects from exposure to high density in a laboratory setting were eliminated when crowded subjects were informed they could leave the room if they needed to.

Revised theory of learned helplessness suggests that it is a more complex phenomenon in human beings. Particularly, the attributions individuals make about the causes of their inability to control a stressor bear directly on whether or not helplessness is likely to occur or generalise to other situations (cf., Abramson, Garber, & Seligman, 1980). Baum and his colleagues (see Baum & Paulus, 1987) found the evidence of revised learned helplessness while studying college students' reactions to crowded dormitories.

Control also affects the coping process of the individual. Coping strategies may shift from problem-focused to emotion-focused in case of chronic exposure to aversive, uncontrollable stressors. An aversive condition that was initially viewed as threatening may be reappraised as a minor problem or threat. As a result, denial of harmful effects or other rationalisation may also occur as continual experience with an uncontrollable, ambient stressor occurs.

Predictability: Research findings support that unpredictable environmental stressors like noise disrupt ongoing behaviour and make more concentration on more difficult tasks. According to Poulton (1977, 1978), distraction is the major mechanism of decrement observed in noise. Physiological consequences of distraction are related to the orienting reflex that triggers a state of mental alertness and vigilance (Berlyne, 1960). Also, unpredictable stressors cause various degrees of environmental stimulation. Environmental settings, which are unfamiliar, ambiguous and difficult to interpret, may be stressful. If an individual is unable to detect the meaning or function of an object or situation, it results in confusion and it may cause stress (Archea, 1978, Gibson, 1979).

Predictability has a close relationship with controllability and stress. Sometimes, it is not clear whether the reduced aversiveness of a stressor is due to control or due to the increase in predictability of the occurrence of that stressor. Aversive events that are more unpredictable are also more difficult to control and prepare for. In unpredictable situation, there is a lack of cues and individuals are not adequately prepared for solving problems that cause stress (Mechanic, 1962; 1978b). Predictability is also associated with the concept of interruption. The interruption in response sequences that have previously been organised as the most appropriate for that situation also produce stress (Mandler, 1975) because it results cognitive disorganisation accompanying with emotional arousal.

Systems models: According to systems model, stress occurs when environmental opportunities are insufficient in efforting important personal goal or group needs and goals. Stress is the outcome of incongruence between person and environment (Caplan, 1982, Michelson, 1970, Stokols, 1979).

Several authors have applied this approach to environmental stress primarily to human spatial behaviours. Individual's need for privacy may help regulate proxemic behaviours. Crowding may be viewed as a state of incongruence between the person's desired privacy levels and achieved privacy levels. When desired and achieved privacy match, congruence is achieved and satisfaction results (Altman, 1975). When there is discrepancy between desired and achieved privacy, tension occurs to re-equilibrate the system. If this tension cannot be resolved, stress occurs.

Ecological models of spatial behaviours also have a similar view as systems models. Ecological models emphasise on the maintenance of the relationship between the number of people and the number of roles needed in a setting. When overstaffing occurs, crowding results because of loss of personal involvement and feeling of not being needed by the organisation. In turn, these feelings cause alienation, negative affects and possibly more negative interpersonal interactions (Wicker, 1979, 1987).

Consequences of stressors

Various components of environmental conditions affect our health and well being. Evans and Cohen (1987) have pointed out five such impacts of stressors

Physiological effects: Physiological models of stress suggest that various endocrinological responses have been observed during stress in human beings. It is found that aversive stimuli cause increased catecholamine and corticosteroid output (Baum, Grundberg & Singer, 1982; Frankenhaeuser, 1971; Mason, 1968). These hormones, particularly adrenaline, produce secondary changes in various target organs related to activation of sympathetic arousal. A number of psychophysiological indices of stress include increase of blood pressure, skin conductance, respiration rates, muscle tension, and cardiac outputs (e.g., heart beat rate) (Baum, Grundberg & Singer, 1982; Lazarus, 1966; McGrath, 1970).

Task performance: It is difficult to characterise the influence of stressors on human task performance because most people can effectively overcome the aversive effects of stressors by increasing efforts (coping devices) or concentration. Nevertheless, certain patterns of task deficits occur under stress. Particularly, stressors interfere with those tasks that require rapid detection, sustained attention or attention to multiple sources of inputs. Two types of memory deficits have also been noted under stress. First, memory for incidental or secondary information in a task such as recall of the style of typeface words in the printed material that becomes poorer under stressed conditions. Second, the memory span in working memory may be shorter under stress. Poorer comprehension of complex information such as context or thematic structure occurs because of reduced working memory capacity (Broadbent, 1971; Cohen, Glass, & Phillips, 1979).

Affect and interpersonal behaviour: Stressors influence both self-reports of affect and interpersonal behaviours. Several investigators have noted self-reports of tension, nervousness, as well as greater ratings of stress under aversive conditions (Baum, Singer & Baum, 1982; Lazarus, 1966; McGrath, 1970).

In some studies, researchers have found negative social interpersonal behaviours such as less altruism and co-operation (Cohen, 1980, Evans, 1982) and greater competitiveness, hostility, and aggression (Cohen & Spacapan, 1984, Rule & Nesdale, 1976). Studies suggest that stress also cause deficits in decision making such as fixation on one or two dominant aspects of task, stereotyped thinking, reversion to dominant, traditional thinking are apparent (Janis & Mann, 1977; Janis, 1982). Novel information or tasks that may need different approaches are also redefined in terms of pre-existing schemata (Holsti, 1978, Staw, Sandelands & Dutton, 1981)

Observation: The measurements of verbal and non-verbal indicators of stress have been developed. Speech faults such as repetition, sentence change, and tongue-slips, filled pauses (e.g., ah, um), accelerated rate under certain conditions and increased pitch have been included as the indicators of stress. Some words or phrases such as hopeless, worried may occur to reveal the tension or anxiety about the present problem (Spence, 1982; Siegman, 1982). Investigators have reported several non-verbal behaviours such as defensive body posture (e.g., lean away, arm/leg cross, reduced eye contact or facial regard, greater automanipulative behaviours (e.g., itching, touch hair, fidgeting with clothes), and stereotyped object play (e.g., tapping pencil, manipulation of small objects) as the indicators of stress (Ekman & Friesen, 1974; Hutt & Hutt, 1970, McGrath, 1970, Webb, Campbell, Schawartz, Sechrest, & Grove, 1981).

Adaptation: Individual adapts to stressors through various coping mechanisms. Adaptive behaviours may manifest when the stressor is exposed and these behaviours may reduce the immediate stress response in the form of habituation. However, the process itself may be taxing to the individual. The negative after-effects associated with coping reported by several investigators are less ability to cope with subsequent stressors, lower motivation, socio-emotional adjustment problems, and greater susceptibility to infectious diseases (Cohen, 1980; Dubos, 1965; Glass & Singer, 1972).

Adaptive effects can be clustered into three groups. The first group of adaptive effects includes habituation or decrements in response sensitivity with repeated exposures to a stressor (Glass & Singer, 1972; Wilkinson, 1969). The second group adaptive effects are related to the cumulative or residual costs of coping with stressors. These types of after-effects include decrements in tasks that require moderate to high motivation, decreased altruism and sensitivity to the needs of others, increased

aggression, and increased susceptibility to learned helplessness. Overgeneralization of coping response is also another type of residual (See Cohen et al., 1980). The third groups of after-effects that result from chronic exposure to stressors include physiological and psychological disorders. Selye (1956, 1975) and Dubos (1965) have suggested that when adaptive resources are continually utilised over long periods, some deleterious effects are likely to occur. Physiological effects associated with coping with chronic stressors include cardiovascular disorders, gastrointestinal problems, and lowered immunological resistance to infectious diseases (Dubos, 1965, Elliot & Eisdorfer, 1982, Moss, 1973). Exposures to chronic stressors are also linked with psychological disorders including symptomatology, case openings, and hospitalisation (Dohrenwend & Dohrenwend, 1974; Neufeld, 1982, Rabkin & Struening, 1976, Thoits, 1983).

Emerging Research Questions, Objectives and Hypotheses

For adopting effective ways to deal with the environmental problems, it is critically important to understand people's perception and reactions to such problems. The preceding review suggests that the urban physical environment have many negative features like air pollution, garbage, water pollution, noise, overcrowding, and so on. The urban dwellers have to confront these environmental conditions everyday. There is growing evidence that such features of urban environment produce stress directly and indirectly on the urban dwellers. Environmental conditions such as air and water pollution, and accumulated garbage are harmful because they have noxious agents such as carbon monoxide, sulphur dioxide, dust particles in air, several disease spreading virus and bacteria in garbage, and various poisonous chemicals and bacteria like *ecoli* in water. All of them are direct threat to human health and well being. In somewhat indirect ways, they cause discomfort and displeasure and are sources of frustration, anxiety, and irritations that may disturb individuals' task performance in everyday life. Thus, the urban physical environment becomes the source of stress and therefore, these physical conditions are treated as environmental stressors in this study in relation to environmental pollution.

The literature review shows that most of the earlier research in psychology on environmental issues has mainly focused on crowding and noise rather than on air pollution, garbage, and water pollution. Social psychologists in U S A , however, have studied littering in public places (Baltes & Hayward, 1976, Bickman, 1970, Clark, Hendee, & Campbell, 1971, Geller, Witmer, & Oreabaugh, 1972; McCool & Merriam, 1970, Robinson, 1976;) They have studied on attitudes and behaviours related to littering and norms to reduce littering in public places (Cialdini, Reno, & Kallgren, 1990, Herberlein, 1971) Often-studied subjects related to littering and solid waste include knowledge about recycling (Gamba & Oskamp, 1994; Granzin & Olsen, 1991; Simmons & Widmar, 1990), attitudes toward conservation (Simmons & Widmar, 1990), influence of behavioural intervention (Porter, Leeming, & Dwyer, 1995), past recycling behaviour (Lasana, 1992, Lee, De Yoing, & Marans, 1995), and influence of political socio-economic variables (Gamba & Osakamp, 1994, Hong, Adams, & Love, 1993, Oskamp Harrington, & Edward, 1991, Reschovsky, & Stone, 1994, Vining & Ebreo, 1990) But the problem related to garbage in developing countries like Nepal is different from the developed countries in terms of the nature of materials disposed, volume of accumulation, and management of garbage disposal. Further, it is rarely any psychological study on stress related to garbage and water pollution In the Annual Reviews of Psychology and in the Handbook of Environmental Psychology edited by I Altman and D Stokols (1987), water pollution and garbage are not included In the western world, these problems have been solved or are under control But in developing countries like Nepal, these are acute environmental problems requiring immediate actions The review section presents a horrifying state of physical conditions of Kathmandu City, i e , the levels of air pollution, garbage accumulation, and water pollution The environmental stressors (air pollution, garbage, and water pollution) selected for this study are direct threat to people's health and well being, therefore, understanding of people's perceptions and coping behaviours in relation to these stressors is important.

It is almost evident that the physical properties of urban environment, i e , air, garbage, and water pollution, are related to human stress. It is necessary to understand how, when, and why these environmental conditions induce stress in individuals It is also necessary to know about the coping strategies that the individuals use in day to day functioning with the degraded environmental conditions The impact of environmental

stressors on physical and psychological health requires understanding. One of the objectives of this study was to identify the health status (physical and psychological health) of urban dwellers.

The literature on environmental stress reviewed in the preceding section suggests that appraisals about the environmental situation by individuals determine stress. Whether the environment is being appraised as threatening, challenging or benign, and whether one has personal resources to deal with them or not, are crucial for inducing stress to the individual. This study focuses on measuring the respondents' perception of intensity of polluted environment and control over the environmental stressors. It was planned to study to what extent the city residents would experience stress as they are exposed to the environmental conditions and the relationships across various perceptions of intensity, control, experience of stress, coping strategies, and health.

The review further suggests that individuals react differently as they differ in appraisals of the environmental situation. Based on his/her appraisals of the situation and personal resources or capabilities, one chooses some out of several coping strategies to deal with the situation. Coping consists of cognition, and behaviours that people use to assess and reduce stress and to moderate the tension that accompanies it (Billings, Cronkite, & Moos, 1983). Sometimes he/she tries to change the situation (problem focused coping) through direct action, or tries to escape from stress causing situation, or collect information about the environment. Sometimes he/she tries to cope with the environmental stressors by changing his/her emotional reactions (emotion focused coping) by ignoring, or accepting the situation as a reality, or becoming helpless. This study planned to measure the coping strategies that the urban residents were using to deal with the environmental stressors.

The review further suggests that continuous exposures to the environmental stressors may have adverse effects on health. Objective measures of the environmental conditions have been used to explain the impact on health. The experiential aspects of environmental stressors may be a critical factor for explaining the impact on health. This study was planned to investigate the relationships between health and other perceptual as well as experiential variables of environmental stressors. It was also planned to see

to what extent people's perceptions of environmental conditions and their background could predict health.

Apart from the relationships among the variables related to environmental stressors, it was also conjectured that individuals with different role relationships perceive the situation differently and also react in a different manner. So, one of the objectives of the present study was to find the extent to which the male and female respondents differ in perception of environmental stressors and also to highlight the gender differences in coping strategies while dealing with environmental stressors. Another objective of the study was to see to what extent location variation affects perception of the environmental stressors. The locations selected for this study were two types of neighbourhoods with different physical settings. They were also different in socio-economic standard. More detailed description of the locations is given in the next chapter on method. It would be interesting to study whether such location variations lead to differential perceptions of environmental stress.

In addition to gender and location differences, the study was also planned to investigate the role of residential status (migrants or non-migrants) in perception of environmental stressors. It would be interesting to study differences between migrants and non-migrants in perceptions and more importantly, how migrants differ from the non-migrants in adopting the coping strategies when dealing with environmental stressors. It is also planned to know to what extent migrants and non-migrants differ in their health status.

Hypotheses:

Due to variation in the background characteristics such as age, education, income, gender role, location of residence, residential status (migrant or non-migrant) and several others, the respondents would differ in perception of environmental conditions such as intensity, control, and experienced stress, and various coping strategies related to pollution. The following specific hypotheses were formulated regarding the relationships between demographic (age, education and family income) and major variables.

H₁

With the increase in the age of respondents, there would be a decrease in the amount of perceived intensity, perceived control, experienced stress, and in the use of problem-focused coping strategies to deal with pollution

H₂

Respondents with increasing age would use greater amount of emotion-focused coping and would also report more health (physical and psychological) problems

H₃

Higher the educational level of respondents, greater would be the amount of perceived intensity, control, and experienced stress, and use of problem-focused coping strategies.

H₄

Higher the educational level of respondents, lesser would be the use of emotion-focused coping and lesser would be the amount of physical and psychological health problems.

H₅

The respondents with increasing amount of family income would perceive lesser intensity, greater control and would use greater amount of problem-focused coping strategies.

H₆

Higher the family income of respondents, lesser would be the experienced stress, emotion-focused coping, and health (physical and psychological) problems

As mentioned earlier, perception of intensity, control, stress, coping strategies, and health problems are interrelated. Therefore, the following hypotheses were formulated.

H₇

Those respondents who perceive greater intensity of pollution would perceive lesser control over pollution.

H₈

Those who perceive greater intensity of pollution would experience greater amount of stress related to pollution and would also use greater amount of coping strategies (emotion-focused and problem-focused)

H₉

Those who perceive lesser control over pollution would experience greater amount of stress.

H₁₀

Those who perceive greater control over pollution would use greater amount of problem-focused coping strategies, but who perceive lesser control over pollution would use greater amount of emotion-focused coping strategies to deal with pollution.

H₁₁

Those who perceive greater amount of intensity and experience greater amount of stress related to pollution and those who perceive lesser control over pollution would report greater amount of physical and psychological health problems

H₁₂

Individuals who use greater amount of emotion and problem focused coping strategies in relation to pollution would report greater amount of physical and psychological health problems.

It has been recently reported that males and females do differ in their coping strategies but not on their perception of pollution (Siddiqui, 1997). Therefore, the hypotheses regarding the gender differences in perception of intensity and control and stress were not formulated. The following hypotheses were formulated regarding the gender differences on coping strategies and health problems keeping in the view the differential gender roles where males deal with outside world and females are taking care of home front

H₁₃

Males would use greater problem-focused coping strategies to deal with air pollution than females

H₁₄

Females would use greater amount of problem-focused coping to deal with garbage and water pollution than males.

H₁₅

Females would use more emotion-focused coping strategies and report greater amount of physical and psychological health problems than males

The physical surroundings are critical for individual's perception and reactions. The following hypotheses were formulated regarding the main effects of location of residence (Bahal and Non-Bahal) and residential status (Migrants and Non-migrant) of respondents on several variables.

H₁₆

Non-Bahal respondents would perceive greater amount of intensity and experienced stress, use greater amount of problem-focused coping, and report greater amount of health problems (physical and psychological) than Bahal respondents

H₁₇.

Bahal respondents would perceive greater control over pollution and would use greater amount of emotion-focused coping than non-Bahal.

H₁₈

Migrants would perceive greater amount of intensity and experience greater amount of pollution stress than non-migrants.

H₁₉

Non-migrant would perceive greater control over pollution than migrants.

H₂₀

Migrants would use more problem-focused as well as emotion-focused coping strategies for pollution than non-migrants

H₂₁

Migrants would report more physical and psychological health problems than non-migrants

CHAPTER 2: METHOD

METHOD

Measures

A structured interview schedule was developed in Nepali language that consisted of the following sections. (1) Background Information, (2) Psychological Scales to measure perceived environmental pollution and (3) Life Events and Health Status Scales Appendix A includes a copy of the questionnaire

1. **Background Information:** Items related to the following demographic information were included in this section of the questionnaire.

- **Age:** The age of respondents was recorded in years rounding months. For example, if she /he reported 31 years and 6 months old, then age was recorded as 32 years. If she / he reported 31 years and 5 months, then age was recorded as 31 years.
- **Gender:** The respondent's gender (male and female) was recorded and later coded as 1 and 2 respectively for data analysis.
- **Religion:** To record the religious background of the respondents, the questionnaire included four religions: Hindu, Buddhist, Muslim, Christian, and also any other option.
- **Caste:** There were several caste categories included in the questionnaire such as Brahmin, Chhetri, Newar, Mongols (Rai, Limbu, Gurung, Tamang, Lama etc.), other castes such as Damai, Kami, Sarki, Pote etc. and also any other option.
- **Occupation:** The occupations included in the questionnaire were unemployed, housewife, labourer, caste occupation, skilled technician/mechanics, service, business and if any other option.
- **Education:** To record the educational level of the respondents, a 9-point continuous scale was developed (1=Illiterate, 2=Literate, 3=Primary, 4=Lower Secondary, 5=Test passed, 6=School Leaving Certificate, 7=Intermediate, 8=Bachelor Degree, 9=Masters Degree and above).

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- **Occupation:** The occupations included in the questionnaire were unemployed, housewife, labourer, caste occupation, skilled technician/mechanics, service, business and if any other option.
- **Education:** To record the educational level of the respondents, a 9-point continuous scale was developed (1=Illiterate, 2=Literate, 3=Primary, 4=Lower Secondary, 5=Test passed, 6=School Leaving Certificate, 7=Intermediate, 8=Bachelor Degree, 9=Masters Degree and above).

- **Family Size:** The number of family members living in the present house was recorded to determine the size of the family
- **Family Structure:** The structure of the family was recorded as nuclear or joint. The family which had husband, wife, and their own children was considered as nuclear family and the family which had other members in the family in addition to husband, wife, and their own children was considered as joint family
- **Duration of Living in this City:** To measure the years of living in the city, a question was framed ("For how long have you been living in this city?") The answer was recorded in years by rounding months. If the respondent was born in the city and living since then, her/his age was recorded accordingly.
- **Migration:** A question was framed to assess whether the respondent was a migrant or a non-migrant or local of the city. Those who were born in the city and living since then or original inhabitants were regarded as non-migrants and those who were born in other places and moved to Kathmandu and have been living for some years were considered as migrants. When the respondent was confirmed as migrant, she/he was followed up by two questions regarding her/his previous place (village or town) from where she/he migrated and how long she/he lived there
- **Family Income:** First, number of family members involved in the economic activities was recorded and then, monthly income from all sources of each family member was recorded in the tabular form with amount separately. Later, by adding the earning of all members from all sources, total family income was calculated

2. ***Perceived Environmental scales:***

The second part of the questionnaire consisted of several scales to measure the perceived aspects of environmental stressors. They were (1) Environmental Intensity Scale, (2) Environmental Control Scale, (3) Environmental Stress Scale, and (4) Environmental Coping Scale. A brief description of these scales is given below.

- ***Perceived Environmental Intensity Scale:*** This scale was developed to measure to which extent respondents perceived the magnitude of environmental stressors in their neighbourhoods. This scale consisted of three dimensions- air, garbage, and water pollution. Each dimension had three items. Respondents had to answer on a five-point interval scale (1=not at all, 2=a little, 3=more or less, 4=much, 5=very much). To measure the internal consistency of the scale, Cronbach alpha was calculated which was found to be .82 for the scale. Cronbach alpha of sub-scales were calculated separately and ranged from .73 to .86 (see Table 7).
- ***Perceived Environmental Control Scale:*** This scale comprised of three sub-scales, which were developed to measure to which extent respondents had control over the environmental stressors. The sub-scales were Perceived Air Pollution Control, Perceived Garbage Control, and Perceived Water Pollution Control. Each sub-scale had three items except Perceived Garbage Control Scale, which had four items. Respondents had to rate on a five-point interval scale to which extent they had control over polluted air, garbage, and polluted water (1=not at all, 2=a little, 3=more or less, 4=much, 5=very much). The Cronbach alpha of the scale was found to be .85. Cronbach alphas of sub-scales were also calculated separately and ranged from .59 to .75 (See Table 7).
- ***Perceived Environmental Stress Scale:*** This scale was developed to assess to which extent the environment had produced stress to the respondents. The scales consisted of three sub-scales related to air pollution, garbage, and water pollution. Each sub-scale had three items. Respondents had to rate the amount of stress they experienced in relation to air, garbage and water pollution in the previous month on a five-point scale (1=not at all, 2=a little, 3=more or less, 4=much, 5=very much). Cronbach alpha for Perceived Environmental Stress Scale was .91. Separately, Cronbach alpha was calculated for sub-scales. Cronbach alpha ranged from .79 to .82 (See Table 7).
- ***Environmental Coping Scale:*** This scale consisted of six items related to coping strategies to air pollution, garbage, and water pollution. The coping strategies were direct action, avoidance, information seeking, ignoring, acceptance, and helplessness. The scale was developed to measure how frequently respondents used these strategies.

in the previous month. Each strategy had one item and respondents had to answer on a five-point interval scale (1=never, 2=rarely, 3=sometimes, 4=frequently, 5=most frequently). Factor analysis was computed using Principal Component Analysis with varimax rotation technique which generated two factors namely (1) Problem-Focused Coping, and (2) Emotion-Focused Coping across three environmental pollution. Table 8,9, & 10 present the results and factor loadings of coping items for air pollution, garbage, and water pollution respectively. A total of 50.9% of variance was explained by two factors extracted from coping items related to air pollution. Factor I (Problem-Focused Coping) accounted for 30.9% and Factor II (emotion-Focused Coping) accounted for 20% of total variance. Similarly, Two factors extracted from coping items related to garbage explained a total of 49.1% of variance. Factor I (Problem-Focused Coping) accounted for 29.8% and Factor II (Emotion-Focused coping) accounted for 19.3% of total variance. Two factors extracted from coping items related to water pollution also explained a total of 46.4% of variance. Factor I (Problem-Focused Coping) and Factor II (Emotion-Focused Coping) explained 26.2% and 20.2 of total variance respectively. Further, the means of emotion-focused items and the means of problem-focused coping items related to air, garbage and water pollution were separately combined to get combined scores of respective coping strategies. Cronbach alphas were also separately calculated for emotion-focused and problem-focused coping items, which were found to be .70 and .68 respectively.

3. Life Events and Health Status Scales:

The last part of the questionnaire consisted of Life Events Scale and Health Status Scale (Psychological and Physical). A short description of the scales is given below

- **Stressful Life Events Scale:** There was a list of twelve life events, which were potential for significant changes in respondent's life. The events were primarily negative and capable of producing certain level of stress in the individual. The included events were death of someone in the family or in friendship circle, serious illness or injury by respondent or any other members of the family, financial crisis, judicial problems, problems in the government office, loss of property, family dispute etc. Respondents

were asked to identify those events, which occurred in the last twelve months. The response was coded 1 and 2 for "No" and "Yes" respectively. The range of total score was 12 to 24. The scale was adapted from Ruback and Pandey (1991).

Health Status Scale: Most of the items of this scale were adapted from Ruback and Pandey (1991). This scale consisted of two sub-scales, one related to psychological health and the other to physical health. The Psychological health scale had thirteen items which inquired about the state of unhappiness, depression, tension, irritation, confusion, loneliness, lack of concentration, lack of sleep, anger, sadness etc. The physical health scale had 20 physical ailments such as headache, rising heart-beat, breathing difficulty, itching, irritation in ear and eyes, blockage of nose, excessive sweating, bodyache, frequent cough and cold, lack of appetite, tiredness, stomach ailments, nausea, etc. Respondents had to answer how frequently they experienced those psychological and physical ailments in the previous month on a five-point scale (1=never, 2=rarely, 3=sometimes, 4=frequently, 5=most frequently). Cronbach alphas were calculated for psychological health scale and physical health, which were found to be .89 and .88 respectively.

Table 7 Dimensions, number of Items, Range of Scores, and Cronbach Alpha for Various Scales. (N=209).

Scales	Dimensions	No. of Items	Range of Scores	Cronbach Alpha
Environmental Intensity		9	9-45	.82
	Air-pollution	3	3-15	.77
	Garbage	3	3-15	.73
	Water-pollution	3	3-15	.86
Environmental Control		10	10-50	.85
	Air-pollution	3	3-15	.75
	Garbage	4	4-20	.75
	Water-pollution	3	3-15	.59
Environmental Stress		9	9-45	.91
	Air-pollution	3	3-15	.79
	Garbage	3	3-15	.82
	Water-pollution	3	3-15	.81
Emotion-Focused Coping to pollution		9	9-45	.70
Problem-Focused Coping to pollution		9	9-45	.68
Psychological Health		13	13-65	.89
Physical Health		20	20-100	.88

Table 8 Varimax-Roted Factor Loadings for Coping Items of Air pollution. (N = 209).

Coping Items	Factor I (Problem-Focused)	Factor II (Emotion-Focused)
Stopped breathing for a while or cover the mouth and nose. (Direct Action)	70	
Avoided going to the place where air is polluted (Avoidance)	63	
Collected information about air pollution (Information Seeking)	.74	
Did not care the air pollution. (Ignoring)		59
Thought air pollution as a reality (Acceptance)		56
Did nothing though wanted to do (Helplessness)		.78
Eigen Values	1.85	1.20
Percentage of variance explained	30.9	20.0

Table 9

**Varimax-Rotated Factor Loadings for Coping Items of Garbage.
(N = 209).**

Coping Items	Factor I (Problem-Focused)	Factor II (Emotion-Focused)
Cleaned the accumulated garbage around the house (Direct Action)	.71	
Avoided going to the place where garbage is accumulated. (Avoidance)	.53	
Collected information about garbage (Information Seeking)	.73	
Did not care the garbage (Ignoring)		.52
Thought garbage as a reality (Acceptance)		.76
Did nothing though wanted to do. (Helplessness)		.68
Eigen Value	1.78	1.16
Percentage of Variance explained	29.80	19.30

Table 10

**Varimax-Roted Factor Loadings for Coping Items of Water Pollution.
(N = 209)**

Coping Items	Factor I (Problem-Focused)	Factor II (Emotion-Focused)
Filtered /boiled the drinking water. (Direct Action)	80	
Avoided drinking the tap water in supply directly (Avoidance)	63	
Collected information about water pollution (Information Seeking)	.58	
Did not care about the water in supply (Ignoring)		58
Thought water pollution as a reality (Acceptance)		63
Did nothing though wanted to do. (Helplessness)		64
Eigen Value	1.57	1.21
Percentage of Variance explained	26.2	20.2

The Context of the Study

The rising growth of population in urban centres is one of the most notable features of the world. Every year thousands of people migrate from rural areas and small towns to urban centres in search of better employment opportunity and for better living condition.

Between 1952/54 and 1991, population of Nepal increased from 8.3 million to 18.5 million. Similarly, the rural population doubled rising from 8.0 million to 16.8 million. But urban population during the same period of time increased from 236 thousand to 1.7 million, about seven times greater. In the last 10 years (between 1981 and 1991) alone, the urban population raised by 77 per cent. The corresponding increases in the rural and the total population were 19 and 23 per cent respectively (Bastola, 1995). Population of Kathmandu was estimated 105.2 thousand in 1952/54, which increased up to 121.0 thousand in 1961, 150.4 thousand in 1971, 235.2 thousand in 1981, and 421.3 thousand in 1991. Population of Kathmandu has increased notably since 1981 and the trend will still remain for some years to come. Internal migrants to urban areas constituted 16.3 per cent in 1981 and 17.2 per cent in 1991. Internal migration is considered as an important factor for the growth of population in Kathmandu. A majority of inter-regional migrants direct to Kathmandu (KC, 1996). In 1981, there were 12.4 per cent migrants out of total population in Kathmandu, the figure increased 19.6 per cent in 1991. Central Bureau of Statistics, HMG/ Nepal (1997) has reported that there are 81139 households in Kathmandu Metropolitan City and average household size is 5.2.

Urban growth of Kathmandu City is accompanied by several challenges to maintain its infrastructure, employment, and sanitation properly. There are unplanned squatter settlements without basic facilities like wide roads, supply of piped drinking water, drainage and swage system. Expansion of slums is rapid inside and outside the Ring road. Heaps of stinking garbage are on the roadside; public transport is crowded and has been exhausting many harmful gases and particulate. City roads, buses, and public places are overused; water supply is fragile allowing sewerage to seep into drinking water and spread infectious diseases.

The study mainly focuses on the residents of the urban dwellers, who live in the city facing the degraded environmental condition.

The Sample

The sample comprised of a predominantly lower middle socio-economic class. They were living in Kathmandu City for some years. The sample consisted of both migrants and non-migrants (local or natives), almost in equal proportion. Most of them had regular source of income and were educated. The distribution of residents indicates that non-migrants were slightly more (52.6%) than migrants (47.4%) in the entire sample. However, the non-migrants were more in Bahal (58.5%) than the migrants in non-Bahal. Majority of migrants (75.2%) was from villages and rest 24.8% of migrants was from other towns.

Justification of the sample

The respondents were living in the city where the environmental pollution is comparatively acute. There are some studies conducted on the physical environment of Kathmandu City, especially on air quality, garbage accumulation, and drinking water quality, but it is rare to find studies on the city dwellers who are living in the centre of the city and experiencing of environmental condition. Thus, this study is an attempt to understand perception and responses of the lower-middle class city residents to environmental condition of Kathmandu.

Sample Size

The total figure of city dwellers interviewed was 209 from two types of neighbourhoods. Of this number, 100 were males (47.84%) and 109 were females (52.16%). The distribution of males and female in two types of neighbourhoods was almost in equal proportion, 51 males (48.1%) and 55 females (51.9%) in Bahal and 49 males (47.6%) and 54 females (52.4%) in non-Bahal.

Location

The location of this study was Kathmandu City, the capital city of Nepal. Kathmandu is the biggest city of Nepal, but it is smaller in comparison to other capital cities of the world in terms of population, expansion of areas and use of modern facilities. The City is the focus of all major facets of a country, namely economy, tourism, culture, politics and administration. The city of Kathmandu shares the area of Kathmandu valley with other two towns, Lalitpur and Bhaktapur. The city is located in west-central part of the valley. The climate and physiographic nature of the city is similar to the valley. A brief description of the valley will be useful to understand the Kathmandu City.

Kathmandu valley is located between latitudes 27.34° N and 27.50° N and longitudes 85.11° and 85.32° . The valley is roughly elliptical in outline, its east, and east-west axis being about 25 kilometres in length with a maximum north-south width of nearly 19 kilometres. Its area is approximately 339 Sq. Km. The valley lies at an average altitude of 1350m above sea level. Hills and mountain ranges surround the valley. A couple of hills are above 2,700m in elevation. The climate of the valley is considered to be temperate but influenced by the tropical monsoon. May to June is hot weather followed by a well-defined monsoon in July, continuing through August and September. Winds are ordinarily light throughout the year. However, strong winds are sometimes there before and during the hot season. The temperature in Kathmandu goes down below the freezing point in the winter and it goes up to 35°C . Fog is common from October to February. Surrounding hills are covered with shrubs and in higher hills in some places there are slightly to moderately dense forests.

Selection of locations: For this project, two types of neighbourhoods, Bahal and Outskirts (Non-Bahal) were selected. Two Bahals from the central city and two outskirts of the city were selected. A brief description of both types of neighbourhoods is given below.

Bahal (centre of the city): A Bahal is a typical and traditional architecture of Kathmandu. Most of the Bahals of Kathmandu City lies in the centre close to the commercial centre. That is why, they have been used for as residential as well as commercial purposes. In a typical Bahal, there are approximately 100 dwelling units,

which share a common squared courtyard in the centre. The courtyard is commonly used by the residents for various activities such as play ground for youngsters, place for a feast, social activities and so on. The facilities include tap, handpumps, well, and garbage collection place. Bahal almost represents a community living. Mostly Newars, native people of Kathmandu, live in those Bahals, however, due to commercial expansion and need of householder, some non-natives from other parts of the country have been living there as tenants for years.

Non-Bahal (Outskirts): The outskirts selected for this study were located on the north-east part of the Kathmandu City, not very far from the main city. They were situated in a radius of less than 5-kilometre distance; however, there were some noticeable physical and socio-demographic differences from Bahal. First, there were relatively new settlements. Second, most of the newcomers or migrants from different parts of the country are living there. Third, as a result of second, we find more heterogeneous ethnic groups. Physical facilities like electricity, piped drinking water etc are inadequate. These outskirts are well connected with main City by roads. Some modern concrete buildings are also built there with more spaces outside the houses.

The Respondents:

The distribution of respondents according to their religious affiliation showed that the respondents were primarily Hindu (73.2%) and Buddhist (26.8%). The caste distribution of sample is given in Table 11. The Table depicts that Newars, the native people of Kathmandu, constituted more than half of the sample (52.6%) and they were more in Bahal than in Non-Bahal and majority of them was non-migrants. The other castes were Chhetris (23.9%), Brahmins (15.8%), and Mongols (7.7%). The Brahmins and Chhetris enjoy the higher social status in caste system in Nepal. Mongols consisted of several castes such as Rai, Limbu, Gurung, Lama etc.

The age distribution of age of respondents ranged from 18 to 65 years. For the whole sample, majority of the respondents (54.1%) was between 26 to 50 years of age. In Bahal, the maximum number of respondents (50%) age range was 26-50 years. Similarly, in non-Bahal majority of the respondents (58.3%) age range was 26-50 years. The mean age of the total sample was 31.9 years. Table 14 shows that the mean age of

Bahal sample (32.25 years) was slightly higher than the non-Bahal sample (30.10 years). The Table 14 shows that the age of non-migrant respondents was higher than the age of migrant respondents.

Distribution of educational background of respondents is given in Table 12, which shows that majority of respondents (62.2%) had high school and above level of education. There was similarity in the high school and above level of educational background of the respondents in Bahal and non-Bahal. But there were more respondents in Bahal than non-Bahal having no formal education.

Table 13 presents the distribution of occupation of the respondents. The Table depicts that in the total sample, most of the respondents were either housewives (34.0%) or service-holder (36.4%). However, in Bahal there were more housewives (39.6%) than in non-Bahal (28.2%). But there were more service holders in non-Bahal (48.5%) than in Bahal (24.5%). Business as occupation was not taken in the non-Bahal sample, only Bahal sample had business as occupation (17.9%). There were more respondents (12.3%) in Bahal who answered as unemployed than in non-Bahal (1.9%). Among the migrant respondents, service was their main occupation (42%), followed by housewife (26.3%), but among the non-migrants, 40.9% of the respondents were housewife and 30.9% were service-holders.

The family structure of the respondents indicates that one half of the respondents were living in the nuclear family (48.3%) and another half of the respondents were living in the joint family (51.7%). The average size of the family members was 6.05 (See Table 14). Most of the respondents (74.2%) reported that more than five members of their families were living in the city.

The distribution of earning members in the family ranged one to seven members indicating that about three fourth of the respondents (72.2%) had one or two earning members in the family. The average income of the family was Rs. 67.75 hundred in a month. The Table 14 shows that the non-Bahal respondents had more monthly family income (Rs. 69.81 hundred) than the Bahal respondents (Rs. 65.97 hundred) and non-migrants had more monthly family income (Rs. 70.92 hundred) than migrants had (Rs. 64.46 hundred).

Table 11 Caste Distribution of the Respondents (%)

Castes	Male (n=100)	Female (n=109)	Bahal (n=106)	Non-Bahal (n=103)	Non-Migrant (n=99)	Migrant (n=110)	Total (N=209)
Brahmin	18.0	13.8	9.4	22.3	10.9	21.2	15.8
Chhetri	30.0	18.3	20.8	27.2	12.7	36.4	23.9
Newar	48.0	56.9	67.0	37.9	74.5	28.3	52.6
Mongol	4.0	11.0	2.8	12.6	1.8	14.1	7.7

Table 12 Distribution of Educational Levels of the Respondents

Educational Levels	Male (n=100)	Female (n=109)	Bahal (n=106)	Non-Bahal (n=103)	Non- Migrant (n=99)	Migrant (n=110)	Total (N=209)
Illiterate	-	11.0	6.6	4.9	9.1	2.0	5.7
Literate	6.0	9.2	9.4	5.8	10.0	5.1	7.7
Primary	4.0	4.6	3.8	4.9	1.8	7.1	4.3
Lower	4.0	12.8	10.4	6.8	11.8	5.1	8.6
Secondary							
Test Passed	7.0	11.0	7.5	10.7	5.5	13.1	9.1
SLC	10.0	13.8	12.3	11.7	13.6	10.1	12.0
Intermediate	37.0	19.3	28.3	27.2	24.5	31.3	27.8
Bachelor	25.0	15.6	18.9	21.4	20.0	20.2	20.1
Masters	& 7.0	2.8	2.8	6.8	20.0	20.1	4.8
Above							

Table 13 Distribution of Occupations of the Respondents (%).

Occupation	Male (n=100)	Female (n=109)	Bahal (n=106)	Non-Bahal (n=103)	Non- Migrant (n=99)	Migrant (n=110)	Total (N=209)
Housewife	-	65.1	39.6	28.2	40.9	26.3	34.0
Labourer	20.0	00.9	00.9	19.4	5.5	15.2	10.0
Caste	--	2.8	00.9	1.9	1.8	1.0	1.4
Occupation							
Skilled	3.0	00.9	3.8	-	3.6	-	1.9
Technician							
Service	49.0	24.8	24.5	48.5	30.9	42.4	36.4
Business	16.0	2.8	17.9	-	11.8	6.1	9.1
Unemployed	12.0	2.8	12.3	1.9	5.5	9.1	7.2

Table 14 Means and SDs of Demographic Variables.

Variables	Male (n=100)	Female (n=109)	Bahal (n=106)	Non- Bahal (n=103)	Non- Migrant (n=99)	Migrant (n=110)	Total (N=209)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Age	31.26 (11.20)	31.12 (10.31)	32.25 (12.17)	30.10 (8.91)	34.85 (12.60)	27.11 (5.94)	31.19 (10.72)
Family Size	5.83 (3.76)	6.25 (3.38)	6.39 (4.05)	5.70 (2.96)	7.23 (3.58)	4.74 (3.06)	6.05 (3.56)
Earning Members	1.91 (1.01)	2.05 (1.16)	1.88 (1.05)	2.08 (1.12)	2.07 (1.08)	1.89 (1.10)	1.98 (1.09)
Family Income	63.43 (40.99)	71.93 (41.46)	65.97 (35.97)	69.81 (46.34)	70.92 (41.98)	64.46 (40.59)	67.75 (41.22)
Living in City (in Years)	20.83 (17.36)	24.07 (15.81)	24.51 (18.04)	20.48 (14.81)	34.83 (12.62)	8.85 (7.04)	22.52 (16.61)
Lived in Village/Town before Migration (in Years)	16.39 (5.94)	16.12 (9.86)	18.00 (5.91)	14.89 (5.51)	-----	16.17 (5.87)	16.27 (5.87)

Procedure

To achieve the goal of representative sampling the interviewers adopted an approach to achieve randomisation. Adult members, both males and females, from every second house of the study area were chosen for the interview. If the respondent was not available or did not like to participate, the next house respondents were contacted. The respondents were interviewed at their homes in Nepali language by four interviewers (two males and two females). One of the interviewers was the researcher himself. One male and one female interviewer approached the house and contacted an adult member or the house-head and told him/her about the purpose of their visit and at the same time, requested for his/her participation in the study. He/she was further told that one male and one female member of his/her family was needed in the study and would be separately interviewed.

Respondents were informed that the study was related to environmental pollution and the interviewer would ask some question regarding the environment of neighbourhood and would take about half an hour. Respondents were assured that their responses would remain anonymous and confidential. After getting consent of the respondent, the interview started. Male interviewers interviewed the Male respondents and female interviewers interviewed female respondents. The respondents' questions and enquiries regarding the study were patiently answered. The time taken for the interviews ranged from 25 minutes to 45 minutes.

Problems in data-collection

1. Generally, adult males were not found at home in the daytime, while females were busy in their household works in the morning and evening. Therefore, it was difficult to get a pair of adult males and females at a time. To solve this problem, females were interviewed in the daytime and males were interviewed in the morning and evening and holidays (Saturday is the government holidays in Nepal). However, this strategy became partly successful. Therefore, some male and female respondents do not come from the same house.

- 2 It was difficult to understand the scale at first for those respondents who had lower education level. They were explained with the help of examples given in the questionnaire schedule to follow the scale.
- 3 Some respondents were complaining that the government was doing nothing to this problem. They just come and fill the form and forget it. Interviewers clarified that they were not doing the government job, but it was an academic research, which may help indirectly after its publication.
- 4 Some respondents were hesitant to give details of their family income, especially whose occupation was business. When they were hesitant, they were assured about the confidentiality of their income and were requested to give details, however, they were not forced and interview continued.

CHAPTER 3: RESULTS

Results

The results of the study are presented in three sections. The first section reports the correlation among the variables. The second section presents the means and F ratios related to main effects and interaction effects for location (Bahal and Non-Bahal), gender and the residential status (migrants and non-migrants). The third section presents the results of backward regression analysis showing psychological and physical health as criterion variables and background variables (age, education, income), perceived variables related to pollution of air, garbage and water (intensity, control, experienced stress), and life events as predictor variables.

Section A

The correlations of demographic variables such as age, education, and family income with other variables were computed separately for various groups (Male, Female, Bahal, Non-Bahal, Non-migrant, migrant) and are presented accordingly in Tables 15 to 17.

Correlations between Demographic and Perceived Variables for Male and Female Groups

Table 15 presents the correlation results of male and female groups. The Table shows the correlations of demographic variables such as age, education, and family income with several variables related to pollution, health, and life events. The Table content reveals that male respondents' age was significantly and negatively correlated with perceived intensity of air pollution, and experienced stress associated with air and garbage pollution. Further, the Table shows that the age of male respondents had significant positive correlation with physical health. It implies that the male respondents with increasing age reported greater amount of physical health problems. The age of the male respondents was further negatively and significantly associated with problem-focused coping strategies to air and water pollution.

Table 15 Correlations between Demographic Variables and Perceived Variables for Males and Females

	Male (n=100)			Female (n=109)		
	Age	Educati on	Family Income	Age	Educati on	Family Income
Perceived intensity of						
• Air pollution	-.20*	.07	.13	-.19*	.17*	-.00
• Garbage Pollution	-.03	-.14	-.00	.03	.05	-.18*
• Water pollution	.07	-.16	-.13	-.09	-.11	-.08
Perceived Control over						
Air pollution	-.07	.02	-.06	-.29**	.15	.02
Garbage Pollution	.00	.16	-.02	-.11	.15	.04
Water pollution	.07	.13	.01	-.07	.07	.07
Experienced Stress						
• Air pollution	-.38***	.02	-.01	-.15	.18*	-.25**
• Garbage Pollution	-.28**	.03	-.03	-.21*	.12	-.19*
• Water pollution	-.16	.01	-.09	-.16*	.02	-.28**
Problem-Focused Coping for						
• Air pollution	-.19*	.11	-.08	-.19*	.26**	-.04
• Garbage Pollution	.04	.06	-.11	-.13	.17*	-.06
• Water pollution	-.30***	.31**	.08	.14	.40***	.08
Emotion-Focused Coping for						
• Air pollution	-.12	.01	.10	.02	.00	-.23**
• Garbage Pollution	-.03	.03	-.04	-.07	.10	-.20*
• Water pollution	-.12	-.13	-.04	.07	.03	-.29**
Physical Health	.17*	-.23*	-.16	-.11	-.12	-.05
Psychological Health	.03	-.17*	-.15	-.31***	-.04	.01
Life Events	.01	-.06	-.22*	-.09	-.14	-.07

*p <.05; **p <.01; ***p <.001 (1-tailed)

The results further reveal that male respondents' educational level had positive correlation only with problem-focused coping strategies for water pollution. But male respondents' educational level was significantly and negatively correlated with physical and psychological health. Male respondents' family income was significantly and negatively correlated with life events and physical health.

Table 15 further shows the relationships between age, education and family income of female respondents and several other variables. The Table contents reveal that female respondents' age was significantly and negatively correlated with perceived intensity of air pollution, perceived control over air pollution, stress associated with garbage and water pollution, and also with problem-focused coping to air pollution. The Table further reveals that the age of female respondents was significantly and negatively correlated with psychological health. It implies that ageing female respondents reported lesser amount of psychological health related symptoms.

The results further shows that educational levels of females had significant positive correlations with perceived intensity of air pollution and experienced air pollution stress. Educational levels of female respondents also had significant positive correlations with problem-focused coping strategies to air, garbage and water pollution. The results further reveal that family income of female respondents was significantly and negatively associated with perceived intensity of garbage experienced pollution stress (air, garbage and water). The family income of female respondents was also significantly and negatively correlated with emotion-focused coping strategies to air, garbage, and water pollution.

Table 16 Correlations between Demographic Variables and Perceived Variables in Bahal and Non-Bahal Groups

	Bahal (n = 106)			Non-Bahal (103)		
	Age	Educatio n	Family Income	Age	Educati on	Family Income
Perceived intensity of						
• Air pollution	-.26**	.15	.04	-.08	.13	.06
• Garbage Pollution	-.13	.03	-.02	.15	-.03	-.15
• Water pollution	.01	-.18*	-.06	-.05	.01	-.15
Perceived Control over						
• Air pollution	-.19*	.09	.07	-.15	.06	-.10
• Garbage Pollution	-.09	.21*	.02	-.03	.12	.00
• Water pollution	-.08	.22*	.12	.08	-.07	.01
Experienced Stress						
• Air pollution	-.41**	.11	-.00	-.05	.05	-.24**
• Garbage Pollution	-.41**	.193*	-.06	-.00	-.02	-.16*
• Water pollution	-.24**	.02	-.14	-.06	.04	-.25**
Problem-Focused Coping for						
• Air pollution	-.28**	.23**	.03	-.07	.16*	-.15
• Garbage Pollution	-.07	.24**	-.02	-.03	-.05	-.13
• Water pollution	-.27**	.36**	.09	.20*	.24**	.09
Emotion-Focused Coping for						
• Air pollution	-.14	-.07	.03	.10	.04	-.14
• Garbage Pollution	-.06	-.00	-.12	-.01	.05	-.11
• Water pollution	-.09	-.10	-.11	.09	-.11	-.18*
Physical Health	.03	-.24**	-.09	.08	-.20*	-.10
Psychological Health	-.08	-.29**	-.11	-.17*	-.03	-.00
Life Events	-.04	-.15	-.04	-.07	-.02	-.21*

*p < .05; **p < .01; ***p < .001 (1-tailed)

Correlations between Demographic and Perceived Variables in Bahal and Non-Bahal Groups

The Table 16 presents the correlations between demographic variables (age, education and family income) and other variables for Bahal and non-Bahal residents

The Table contents reveal that age of respondents for Bahal group had significant negative correlations with perceived intensity of air pollution, perceived control over air pollution, and also with experienced pollution stress (air, garbage and water) It implies that respondents with increasing age in Bahal location perceived lesser amount of intensity of air pollution and also perceived lesser control over it. They further reported that they experienced lesser amount of stress associated with air, garbage and water pollution The age of respondents for Bahal location was significantly and negatively correlated with problem-focused coping strategies to air and water pollution.

The Table further reveals that educational levels of respondents for Bahal location had significant negative correlations with perceived intensity of water pollution and also with physical and psychological health. Education was significantly and positively correlated with perceived control over garbage. Education had also significant positive correlations with problem-focused coping strategies to air, garbage and water pollution.

The Table further shows the relationships between demographic and other variables for non-Bahal group. The Table contents reveals that age had a significant negative correlation only with psychological health. It implies that respondents with increasing age reported lesser amount of symptoms related to psychological health. But age had significant positive correlation with problem-focused coping strategy to water pollution. The results further reveal that education had significant positive correlations with problem-focused coping strategies to air and water pollution in non-Bahal group Further, the Table shows that education had significant negative correlation only with physical health.

Family income of non-Bahal respondents was significantly and negatively correlated with experienced stress related to air, garbage and water pollution, emotion-focused coping to water pollution and life events. It implies that the non-Bahal respondents with

increasing family income experienced lesser amount of stress associated with air, garbage and water pollution, used lesser amount of emotion-focused coping strategies for dealing with water pollution and they also reported lesser amount of life events

Correlations between Demographic and Perceived Variables in Non-migrant and Migrant Groups

The Table 17 presents the results of between demographic variables and other variables for migrant and non-migrant groups. The Table contents reveal that age of non-migrant respondents was significantly and negatively correlated with perceived control over air pollution, experienced air and garbage pollution stress, and also with problem-focused coping strategies to air pollution.

The results further reveal that educational levels of non-migrant had significant positive correlations with perceived control over garbage, problem-focused coping strategies for air, garbage and water pollution. The Table contents further reveal that education had significant negative correlations with physical and psychological health. Table also reveals that family income had significant negative correlation only with problem-focused coping strategies for garbage pollution.

Table 17 Correlations between Demographic Variables and Perceived Variables for Non-migrant and Migrant Groups

	Non-Migrant (n =110)			Migrant (n =99)		
	Age	Educatio n	Family Income	Age	Educatio n	Family Income
Perceived intensity of						
• Air pollution	- .14	.09	.11	-.11	.16	.04
• Garbage Pollution	.08	-.07	-.14	-.16	.06	-.04
• Water pollution	-.06	-.15	-.01	.08	-.04	-.22*
Perceived Control over						
• Air pollution	-.30***	.16	-.10	.08	-.05	.09
• Garbage Pollution	-.16	.23**	-.13	.05	.09	.15
• Water pollution	-.08	.15	-.03	-.02	.00	.11
Experienced Stress						
• Air pollution	-.22*	.11	-.03	-.21*	-.00	-.21*
• Garbage Pollution	-.21*	.09	-.06	-.17*	.03	-.16
• Water pollution	-.15	.06	-.15	-.08	-.05	-.23*
Problem-Focused Coping for						
• Air pollution	-.24**	.31***	-.08	.03	.01	-.02
• Garbage Pollution	-.14	.18*	-.17*	.06	.01	.01
• Water pollution	-.11	.30***	.06	.06	.30***	.14
Emotion-Focused Coping to						
• Air pollution	.03	-.01	.01	-.16	-.04	-.12
• Garbage Pollution	.01	.05	-.13	-.17*	.00	-.06
• Water pollution	.10	-.11	-.10	-.13	-.12	-.17*
Physical Health	.06	-.27**	.01	.08	-.15	-.20*
Psychological Health	-.10	-.25**	.05	.00	-.09	-.13
Life Events	-.04	-.08	-.11	-.05	-.13	-.16

*p < .05; **p < .01; ***p < .001 (1-tailed)

The Table 17 also presents the relationships of demographic variables with other variables for the migrant group. The Table contents show that the age of migrant respondents was significantly and negatively correlated with experienced air and garbage pollution stress, and emotion-focused coping for garbage pollution. The Table further reveals that educational levels of migrant respondents had significant positive correlation only with problem-focused coping for water pollution. Further, the Table contents reveal that family income of migrant respondents had significant negative correlations with perceived intensity of water pollution, experienced pollution stress (air and water), also with emotion-focused coping strategies for water pollution. It implies that respondents with increasing family income perceived lesser intensity of water pollution, experienced lesser amount of stress associated with air and water pollution, and also reported lesser amount of problem-focused coping strategies for dealing with water pollution.

Correlations between Health (Physical and Psychological) and other Variables for Male and Female Groups

The correlations of physical and psychological health with other variables were computed for various groups separately and are presented accordingly in Table 18 to Table 20.

Table 18 presents the correlations of physical and psychological health with variables related to pollution and also with life events for male and female groups. The Table shows that the physical health of male respondents was significantly and positively correlated with perceived intensity of water pollution and experienced air pollution stress. Similarly, physical health had significant positive correlations with emotion-focused coping for garbage and water pollution. The Table contents further reveal that physical health had significant negative correlations with perceived control over garbage and water pollution. It implies that those male respondents who perceived lesser control over air pollution reported greater amount of symptoms related to physical health.

The Table further shows that female respondents' physical health was significantly and positively associated with perceived intensity of air and water pollution, experienced pollution stress (air, garbage and water), and also with problem-focused coping.

strategies for air and garbage pollution and emotion-focused coping strategies for water pollution. It implies that Female respondents who perceived greater amount of intensity of air and water pollution and also experienced stress associated with air, garbage and water pollution reported greater amount of physical health related symptoms. Similarly, those who used greater amount of problem-focused coping strategies for dealing with air and water pollution and who used greater amount of emotion-focused coping strategies for dealing water pollution reported greater of physical health problems.

Further, the Table shows that male respondents' psychological health was positively associated with experienced air pollution stress, emotion-focused coping strategies for garbage and water pollution, and also with life events. It also implies that those respondents who reported more life events reported greater amount of psychological health problems. Psychological health had significant negative correlations with perceived control over garbage and water pollution. It implies that the male respondents who perceived lesser control over garbage and water pollution reported greater amount of psychological health symptoms.

The Table further reveals that for female group, psychological health had significant positive correlations only with perceived intensity of air pollution and problem-focused coping strategies for garbage pollution. It implies that those female respondents who reported greater amount of intensity of air pollution and who used greater amount of problem-focused coping strategies for dealing with garbage, reported greater amount of symptoms related to psychological health.

Table 18 Correlation between Health (Physical and Psychological) and Perceived Variables for Males and Females

	Physical Health		Psychological Health	
	Male (n=100)	Female (n=109)	Male (n=100)	Female (n=109)
Perceived intensity of				
• Air pollution	.04	.16*	.11	.24**
• Garbage Pollution	.04	.05	.02	-.07
• Water pollution	.22*	.34***	.07	.15
Perceived Control over				
• Air pollution	-.10	.11	.00	.10
• Garbage Pollution	-.19*	-.05	-.20*	-.08
• Water pollution	-.29**	.09	-.23*	.02
Experienced Stress				
• Air pollution	.18*	.37***	.24**	.13
• Garbage Pollution	.12	.33***	.12	.04
• Water pollution	.08	.32***	.03	.12
Problem-Focused Coping for				
• Air pollution	.08	.19*	-.02	.08
• Garbage Pollution	.11	.21*	-.01	.22**
• Water pollution	-.03	-.06	-.07	-.09
Emotion-Focused Coping for				
• Air pollution	.15	.01	.09	.04
• Garbage Pollution	.25**	.08	.24**	-.08
• Water pollution	.22*	.17*	.18*	.16
Life Events	.16	.13	.19*	.13

*p <.05; **p <.01; ***p < .001 (1-tailed)

Table 19 Correlation between Health (Physical and Psychological) and Perceived Variables for Bahal and Non-Bahal Groups

	Physical Health		Psychological Health	
	Bahal (n=106)	Non-Bahal (n=103)	Bahal (n=106)	Non-Bahal (n=103)
Perceived intensity of				
• Air pollution	.12	.01	.26**	-.01
• Garbage Pollution	.01	.08	.11	-.15
• Water pollution	.36**	.15	.17*	.03
Perceived Control over				
• Air pollution	-.00	.01	-.04	.18*
• Garbage Pollution	-.14	-.09	-.16	-.11
• Water pollution	-.11	-.05	-.18*	.03
Experienced Stress				
• Air pollution	.28**	.24**	.28**	.07
• Garbage Pollution	.22*	.21*	.16	-.03
• Water pollution	.23**	.14	.10	.02
Problem-Focused Coping for				
• Air pollution	.15	.11	.08	-.04
• Garbage Pollution	.11	.24**	.04	.20*
• Water pollution	.09	-.19*	-.01	-.13
Emotion-Focused Coping for				
• Air pollution	.06	.12	.15	-.03
• Garbage Pollution	.10	.29**	.03	.19*
• Water pollution	.20*	.23*	.22*	.16
Life Events	.06	.27**	.17*	.14

*p < .05; **p < .01; ***p < .001(1-tailed)

Correlations between Health (Physical and Psychological) and other Variables for Bahal and Non-Bahal Groups

The Table 19 presents the correlations of physical and psychological health with other variables for Bahal and Non-Bahal groups separately. The Table contents reveal that in Bahal, physical health had significant positive correlations with perceived intensity of water pollution, experienced pollution stress (air, garbage and water), and also with emotion-focused coping strategies for water pollution. It implies that those who perceived greater intensity of water pollution and who experienced stress associated with air garbage and water pollution, and also who used greater use of emotion-focused coping strategies for water pollution, reported greater amount of symptoms related to physical health.

In non-Bahal group, physical health was significantly and positively associated with experienced air and garbage pollution stress, problem-focused coping strategies for garbage pollution, emotion-focused coping strategies for garbage and water pollution and also with life events. It implies that in non-Bahal location, respondents who experienced greater amount of stress associated with air and garbage pollution, who used greater amount of problem-focused coping strategies for garbage pollution, reported greater amount of physical health problems. Similarly, those who reported greater amount of life events also reported greater physical health symptoms.

In Bahal, psychological health had significant positive correlations with perceived intensity of air and water pollution, experienced air pollution stress, and emotion-focused coping strategies for water pollution. It implies that those who perceived greater amount of air and water pollution intensity, who experienced greater air stress, and used more emotion-focused coping strategies to water pollution, reported greater symptoms of psychological health. Further, it also implies that those who reported greater amount of life events also reported greater psychological health symptoms. Psychological health was significantly and negatively correlated only with perceived control over water pollution. It implies those who perceived lesser control over water pollution reported greater amount of psychological health related symptoms.

Table 20 Correlation between Health (Physical and Psychological) and Perceived Variables for non-migrant and migrant Groups

	Physical Health		Psychological Health	
	Non-migrant (n=110)	Migrant (n=99)	Non-migrant (n=110)	Migrant (n=99)
Perceived intensity of				
• Air pollution	.00	.15	.18*	.02
• Garbage Pollution	-.01	.07	-.00	-.08
• Water pollution	.21*	.33**	.12	.08
Perceived Control over				
• Air pollution	.03	-.04	.09	-.00
• Garbage Pollution	-.02	-.26**	-.03	-.27**
• Water pollution	.03	-.22*	-.01	-.12
Experienced Stress				
• Air pollution	.26**	.27**	.23**	.06
• Garbage Pollution	.14	.30***	.09	-.03
• Water pollution	.15	.21*	.08	-.01
Problem-Focused Coping for				
• Air pollution	.12	.12	.00	-.02
• Garbage Pollution	.12	.23**	.09	.18*
• Water pollution	.01	-.08	-.12	.00
Emotion-Focused Coping for				
• Air pollution	.03	.17*	.02	.13
• Garbage Pollution	.11	.30***	.09	.14
• Water pollution	.29**	.13	.27**	.08
Life Events	.07	.20*	.14	.15

*p < .05; **p < .01; ***p < .001 (1-tailed)

For non-Bahal group, psychological health was significantly and positively correlated with perceived control over air pollution, problem-focused coping strategies for garbage, and also with emotion-focused coping for garbage. It implies that those who perceived greater control over air pollution, and who used more both problem-focused and emotion-focused coping strategies to garbage pollution, reported greater amount of psychological health related symptoms.

Correlations between Health (Physical and Psychological) and other Variables for Migrant and Non-migrant Groups

The Table 20 presents the correlations between physical and psychological health with other variables for non-migrant and migrant groups separately. The Table reveals that for non-migrant group, physical health was significantly and positively associated with perceived intensity of water pollution, experienced air pollution stress, and emotion-focused coping strategies to water pollution. It implies that those who perceived greater intensity of water pollution, who experienced greater amount of air pollution stress, and who used greater amount of emotion-focused coping strategies for dealing with water pollution, reported greater amount of physical health related symptoms.

For migrant group, physical health was significantly and positively correlated with perceived intensity of water pollution, experienced pollution (air, garbage and water pollution), problem-focused coping for garbage pollution, and also with emotion-focused coping for garbage. Physical health had also significant positive correlation with life events. Further, physical health had significant negative correlations with perceived control over garbage and water pollution. It implies that those who perceived lesser control over garbage and water pollution reported greater amount of symptoms related to physical health.

The Table further reveals that psychological health of non-migrants was significantly and positively associated with perceived intensity of air pollution, experienced air pollution stress, and emotion-focused coping for water pollution. It implies that those respondents who saw greater amount of air pollution intensity, who experienced greater air stress, and also who used greater amount of emotion-focused coping for dealing water pollution, reported greater amount of physical health symptoms.

For migrant group, psychological health was significantly and positively correlated only with problem-focused coping for garbage pollution. It implies that those who used greater amount of problem-focused coping strategies to deal with garbage pollution reported greater amount of psychological health symptoms. Psychological health had significant negative correlation only with perceived control over garbage. It implies that those respondents who perceived lesser control over garbage pollution reported greater amount of psychological health symptoms.

Inter-correlations among Variables for Different Groups

Inter-correlations among variables were computed for several groups (male, female, Bahal, non-Bahal, non-migrant, and migrant) separately and are presented in Table 21 to 26 accordingly. A look at the Tables 21 to 26 shows that there are several clusters of variables in different groups. Perceived intensity of pollution (air, garbage and water) constitutes a cluster showing positive correlations among them that ranged .11 to .57. The magnitude of correlations reveal that perceived intensity of air pollution had higher positive relationship with perceived intensity of garbage pollution than intensity of water pollution. The magnitude of correlation of perceived intensity of garbage had lower with perceived intensity of water pollution than perceived intensity of air pollution.

Similarly, perceived control over pollution (air, garbage and water) forms another cluster having positive relationships. The correlation coefficients of perceived control ranged from .46 to .70. The pattern of magnitude of inter-correlations among perceived control variables varied in different groups.

The next cluster of variables is experienced pollution stress (air, garbage and water) showing high inter-correlations among them. The correlation coefficient ranged from .54 to .79. The magnitude of correlation was higher between air pollution stress and garbage stress than with water pollution stress.

Table 21 Inter-correlations among Variables for Males (n=100)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Intensity Of Air Pollution	-															
2 Intensity of Garbage Pollution	.57***	-														
3 Intensity of Water Pollution	.39***	.27**	-													
4 Control of Air Pollution	-.30***	-.28**	-.07	-												
5 Control of Garbage Pollution	-.26**	-.27**	.25**	.48***	-											
6 Control of Water Pollution	-.24**	-.18*	-.22**	.52***	.65***	-										
7 Air Pollution Stress	.57***	.39***	.25**	-.12	-.20*	-.19*	-									
8 Garbage Pollution Stress	.52***	.44***	.30***	-.16	-.26**	-.23**	.74***	-								
9 Water Pollution Stress	.38***	.24**	.55***	-.21**	-.21**	-.21**	.63***	.54***	-							
10 Problem-Focused Coping to Air Pollution	.41***	.25**	.12	-.33***	-.48***	-.39***	.39***	.29**	.29**	-						
11 Problem-Focused Coping to Garbage pollution	.38***	.32***	.24**	-.22**	-.43***	-.30***	.37***	.32***	.27**	.34***	-					
12 Problem-Focused Coping to Water Pollution	.23**	.19*	.11	-.11	-.26**	-.13	.45***	.33***	.33***	.33***	.19*	-				
13 Emotion-Focused Coping to Air Pollution	.22**	.24**	.18*	.02	-.02	-.06	.33***	.41***	.33***	.17*	.08	-.01	-			
14 Emotion-Focused Coping to Garbage Pollution	.14	.04	.13	.20	.25**	.27***	.02	.04	.02	.15	.12	.01	.49***	-		
15 Emotion-Focused Coping to Water Pollution	.12	.03	.08	.13	.08	.29***	.21**	.17*	.20*	.16	-.12	.03	.48***	.41***	-	
16 Life Events	.06	.03	.03	.08	-.01	.00	.12	.09	.19*	.14	.04	.03	.10	-.02	.18*	-

Decimal points are omitted from the correlation co-efficient.

*p < .05; **p < .01; ***p < .001 (one-tailed)

Table 22 Inter-correlations among Variables for Females (n=109)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Intensity Of Air Pollution	-															
2 Intensity of Garbage Pollution	.52***	-														
3 Intensity of Water Pollution	.30***	.25**	-													
4 Control of Air Pollution	-.05	-.05	.10	-												
5 Control of Garbage Pollution	-.13	-.09	-.00	.70***	-											
6 Control of Water Pollution	-.11	-.08	-.03	.55***	.57***	-										
7 Air Pollution Stress	.47***	.52***	.33***	.10	-.05	.12	-									
8 Garbage Pollution Stress	.42***	.59***	.35***	.13	-.03	.08	.79***	-								
9 Water Pollution Stress	.40	.49***	.43***	.16*	.08	.09	.74***	.68***	-							
10 Problem-Focused Coping to Air Pollution	.27**	.20**	.14	.17*	.09	.18*	.44***	.52***	.49***	-						
11 Problem-Focused Coping to Garbage pollution	.25**	.10	.16	.17*	.09	.13	.12	.20*	.25**	-.54***	-					
12 Problem-Focused Coping to Water Pollution	.15	.02	.01	-.02	-.03	.18*	.31***	.23*	.29**	.38***	.31***	-				
13 Emotion-Focused Coping to Air Pollution	.28**	.20*	.05	-.25**	-.43***	-.32***	.37***	.27**	.27**	.29**	.21**	.07	-			
14 Emotion-Focused Coping to Garbage Pollution	.28**	.34***	.18	-.07	-.27**	-.18*	.32***	.30***	.26**	.36***	.39***	.18*	.49***	-		
15 Emotion-Focused Coping to Water Pollution	.14	.14	.00	-.01	-.09	-.01	.41***	.20*	.29**	.40***	.33***	.09	.47***	.51***	-	
16 Life Events	.06	.12	-.00	-.13	-.06	-.11	.08	.09	.10	.14	.04	.00	.16*	-.05	-.01	-

Decimal points are omitted from the correlation co-efficient.

*p < .05; **p < .01; ***p < .001 (one-tailed)

Table 23 Inter-correlations among Variables for Bahal group (n=106)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Intensity Of Air Pollution	-															
2	Intensity of Garbage Pollution	.48***	-														
3	Intensity of Water Pollution	.28**	.11	-													
4	Control of Air Pollution	-.19*	-.20*	.07	-												
5	Control of Garbage Pollution	-.24**	-.30***	-.15	.55***	-											
6	Control of Water Pollution	-.28**	-.33***	-.21*	.46***	.60***	-										
7	Air Pollution Stress	.50***	.37***	.18*	-.02	-.12	-.10	-									
8	Garbage Pollution Stress	.46***	.47***	.22*	.07	.10	-.14	.76***	-								
9	Water Pollution Stress	.32***	.22**	.44***	.02	-.04	.11	.64***	.61***	-							
10	Problem Focused Coping to Air Pollution	.27**	.2*	.14*	.17*	.08	.18*	.44***	.52***	.49***	-						
11	Problem Focused Coping to Garbage pollution	.25**	.10	.16*	.17*	.09	.13	.12	.20*	.25**	.48***	-					
12	Problem-Focused Coping to Water Pollution	.15	.02	.01	-.02	-.03	.18*	.31***	.23**	.29**	.41***	.25**	-				
13	Emotion Focused Coping to Air Pollution	.28**	.20*	.05	-.25**	-.43***	.32***	.37***	.27**	.27**	.13	.15	.03	-			
14	Emotion-Focused Coping to Garbage Pollution	.28**	.34***	.18*	-.07	-.27***	-.18*	.32***	.30***	.26**	.18*	.24**	.10	.52***	-		
15	Emotion-Focused Coping to Water Pollution	.14	.14*	.00	-.01	-.09	-.01	.41***	.20*	.29**	.31***	.05	.18*	.46***	.42***	-	
16	Life Events	.06	.12	-.00	-.13	-.06	-.11	.08	.09	.10	.01	-.06	-.06	.13	-.08	.01	-

Decimal points are omitted from the correlation co-efficient.

*p < .05, **p < .01; ***p < .001 (one-tailed)

Table 24 Inter-correlations among Variables for Non-Bahal Group (n=103)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Intensity of Air Pollution	-															
2 Intensity of Garbage Pollution	.66***	-														
3 Intensity of Water Pollution	.47***	.43***	-													
4 Control of Air Pollution	-.17*	-.15	-.07	-												
5 Control of Garbage Pollution	-.13	-.12	-.14	.63***	-											
6 Control of Water Pollution	-.06	.00	-.03	.65***	.60	-										
7 Air Pollution Stress	.54***	.56***	.44***	-.01	-.13	.05	-									
8 Garbage Pollution Stress	.48***	.55***	.46***	-.11	-.19*	-.00	.75***	-								
9 Water Pollution Stress	.47***	.50***	.55***	-.10	-.09	-.03	.73***	.65***	-							
10 Problem-Focused Coping to Air Pollution	.38***	.39***	.18*	.13	.07	.06	.39***	.38***	.42***	-						
11 Problem Focused Coping to Garbage pollution	.21*	.18*	.16	.41***	.37***	.39***	.18*	.17*	.25**	.40***	-					
12 Problem-Focused Coping to Water Pollution	.20*	.25**	.13	.18*	.23**	.31***	.13	.11	.16	.26**	.27**	-				
13 Emotion-Focused Coping to Air Pollution	.31***	.38***	.17*	-.14	-.20*	-.16	.33***	.30***	.43***	.39***	.14	.03	-			
14 Emotion-Focused Coping to Garbage Pollution	.32***	.29**	.21*	.01	-.16	-.01	.35***	.37***	.36***	.36***	.27**	.10	.46***	-		
15 Emotion-Focused Coping to Water Pollution	.35***	.39***	.27**	.01	-.24**	-.04	.44***	.38***	.44***	.26**	.18*	-.04	.48***	.50***	-	
16 Life Events	.07	.09	.05	.17*	.04	.05	.12	.07	.18*	.30	.15	.11	.14	.02	.15	-

Decimal points are omitted from the correlation co-efficient.

*p < .05; **p < .01; ***p < .001 (one-tailed)

Table 25 Inter-correlations among Variables for Non-Migrant Group (n=110)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Intensity Of Air Pollution	-															
2 Intensity of Garbage Pollution	.56***	-														
3 Intensity of Water Pollution	.38***	.23**	-													
4 Control of Air Pollution	-.15	-.18*	.12	-												
5 Control of Garbage Pollution	-.18*	-.22**	.00	.56***	-											
6 Control of Water Pollution	-.18*	-.17*	.09	.53***	.57***	-										
7 Air Pollution Stress	.48***	.44***	.31***	.18***	.02	.11	-									
8 Garbage Pollution Stress	.43***	.54***	.30***	.15	.04	.04	.73***	-								
9 Water Pollution Stress	.41***	.40***	.48***	.10	.08	.10	.67***	.58***	-							
10 Problem-Focused Coping to Air Pollution	.27***	.30***	.23***	.20*	.15	.20*	.42***	.49***	.49***	-						
11 Problem-Focused Coping to Garbage pollution	.22***	.14	.11	.24**	.19*	.26**	.21*	.19*	.24**	.51***	-					
12 Problem-Focused Coping to Water Pollution	.03	.06	-.01	.10	.10	.26**	.36***	.25**	.28**	.37***	.22**	-				
13 Emotion-Focused Coping to Air Pollution	.32***	.32***	.00	-.25**	-.39***	-.35***	.33***	.20*	.29**	.04	.16*	.02	-			
14 Emotion-Focused Coping to Garbage Pollution	.31***	.38***	.11	-.07	-.21*	-.05	.34***	.26**	.26**	.18*	.28**	.11	.52***	-		
15 Emotion-Focused Coping to Water Pollution	.15	.36***	.12	-.02	-.16	-.02	.41***	.26**	.36***	.21*	.15	.11	.38***	.43***	-	
16 Life Events	.06	.07	.11	.16*		.02	.03	.09	.19*	.12	.13	.09	.10	-.03	.17*	-

Decimal points are omitted from the correlation co-efficient.

*p < .05, **p < .01, ***p < .001 (one-tailed)

**Table 26 Inter-correlations among Variables for Migrant Group
(n=99)**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Intensity of Air Pollution	1															
2 Intensity of Garbage Pollution	.57***	1														
3 Intensity of Water Pollution	.37***	.30***	1													
4 Control of Air Pollution	.24**	-.17*	.11	1												
5 Control of Garbage Pollution	-.18*	.14	-.28**	.60***	1											
6 Control of Water Pollution	.12	.10	-.32***	.57***	.64***	1										
7 Air Pollution Stress	.51***	.45***	.30***	-.26**	-.28**	-.13	1									
8 Garbage Pollution Stress	.45***	.47***	.39***	-.22**	-.23**	-.13	.78***	1								
9 Water Pollution Stress	.34***	.29**	.51***	-.20**	.21*	-.20	.69***	.67***	1							
10 Problem-Focused Coping to Air Pollution	.31***	.27**	.10	.10	.04	.11	.34***	.37***	.40***	1						
11 Problem-Focused Coping to Garbage pollution	.30***	.15	.22*	.32***	.27**	.25**	.10	.23*	.30***	.40***	1					
12 Problem-Focused Coping to Water Pollution	.32***	.20*	.14	.02	.09	.24**	.03	.05	.14	.32***	.32***	1				
13 Emotion-Focused Coping to Air Pollution	.24**	.19*	.20*	-.15	-.24**	-.12	.39***	.35***	.39***	.44***	.13	.03	1			
14 Emotion-Focused Coping to Garbage Pollution	.20**	.19*	.26**	.01	-.25**	-.17*	.34***	.42***	.36***	.33***	.21*	.19	.46***	1		
15 Emotion-Focused Coping to Water Pollution	.26**	.10	.12	.02	.18*	-.01	.42***	.28**	.33***	.31***	.19	.02	.56***	.52***	1	
16 Life Events	.06	.16	-.03	.16	-.04	-.05	.13	.07	.10	.15	-.03	.10	.15	-.03	.17*	1

Decimal points are omitted from the correlation co-efficient.

*p < .05; **p < .01; ***p < .001 (one-tailed)

Problem-focused coping for pollution (air, garbage, and water) constitutes a group showing positive relationships. The correlation coefficients ranged from 19 to 54. Problem-focused coping for air pollution had higher correlation with problem-focused coping for garbage pollution than with problem-focused coping for water pollution. Similarly, Problem-focused coping for garbage pollution had lower correlations with problem-focused coping for water pollution than with problem-focused coping for air pollution.

Emotion-focused coping for pollution (air, garbage and water) showing positive inter-correlations forms the next cluster of variables. The correlation coefficients ranged from 38 to 56. The pattern of magnitude of inter-relationships among emotion-focused coping variable is different in different groups.

Further, the Tables 21 to 26 show the inter-correlations between perceived intensity of pollution (air, garbage and water) and perceived control over pollution (air, garbage and water) for different groups. A quick look of the Tables reveals that perceived intensity of pollution had a negative relationship with perceived control over pollution, except for non-migrants in the case of water pollution. It implies that those who perceived greater amount of intensity of pollution reported that they had lesser control over pollution. The correlation between perceived intensity and control of air pollution ranged from - 05 to - 30. The correlation between perceived control over and perceived intensity of air pollution was the highest ($r = -.30$) in the male group and the lowest ($r = -.05$) in the female group.

Similarly, perceived intensity of garbage had negative relationships with perceived control over garbage pollution for different groups. The correlation coefficients ranged - 09 to - 30. Perceived intensity of garbage pollution had the highest ($r = -.30$) correlation with perceived control over garbage for Bahal group and lowest for female group.

The correlations between perceived intensity of water pollution and perceived control over water pollution ranged from $r = -.03$ to $r = -.32$, except having positive correlation ($r = .09$) for non-migrants. The correlations between perceived intensity of and perceived control over water pollution had the highest for the migrants and the lowest for the females.

The Tables reveal that the correlations between perceived intensity of pollution (air, garbage and water) and experienced stress associated with pollution (air, garbage and water) had high positive correlations for all groups. The magnitude of correlations between perceived intensity of air pollution and experienced air stress ranged from .47 to .57. The highest correlation between perceived intensity of air pollution and experienced air stress was found for male group and the lowest for female group.

Similarly, the magnitude of correlation coefficients between perceived intensity of garbage pollution and experienced garbage stress ranged from .44 to .59. The highest and the lowest correlations between perceived intensity of garbage pollution and experienced stress associated with it was found for females and the males respectively. In the case of perceived intensity of water pollution and experienced water pollution stress, the correlation coefficients ranged from .43 to .55. The highest correlation between perceived intensity of water pollution and experienced stress related to it was found for males and non-Bahal group.

The Tables further reveal that perceived intensity of pollution (air, garbage and water) had positive association with problem-focused coping for pollution (air, garbage and water) for all groups. The correlation between perceived air pollution intensity and problem-focused coping for air pollution ranged from .27 to .41. The highest magnitude of correlation between perceived intensity of air pollution and problem-focused coping for air pollution was found for males and the lowest correlation was found for non-migrants and females. The range of correlation between perceived intensity of garbage pollution and problem-focused coping for garbage pollution was .10 to .32. The highest correlation between perceived garbage intensity and experienced stress related to garbage was also found for males and the lowest for females and Bahal group. The correlations between perceived water pollution and problem-focused coping for water pollution were low and not significant in comparison to other two types of pollution that ranged from .01 to .14.

Perceived intensity of pollution (air, garbage and water) and emotion-focused coping for pollution had positive relationships. The magnitude of correlation between perceived intensity of air pollution and emotion-focused coping for air pollution ranged from .22 to .32. The highest correlation was found for non-migrants and the lowest for males.

Similarly, perceived intensity of garbage had positive correlation with emotion-focused coping for garbage pollution ranging from .04 to .30. The correlations were found to be the highest for Bahal group and the lowest for male group. The correlation between perceived intensity of water pollution and emotion-focused coping for water pollution was low and non-significant for all groups that ranged from .01 to .11.

The Tables further reveal that the correlations between perceived control over pollution and experienced pollution stress were negative for all groups, except for non-migrant and female groups. The Tables show that perceived intensity of air pollution had negative and low correlations with experienced air pollution stress, but for non-migrant sample the relationship was positive and significant ($r = .18$). In the case of perceived intensity of garbage pollution, the correlation was negative for all groups, except non-migrant group ($r = .04$). The magnitude of correlation was highest ($r = -.26$) for males and the lowest for females ($r = -.03$). The correlations between perceived control over water pollution was found to be negative and ranged $- .03$ to $- .21$, but for females and non-migrants the correlation were positive ranging from .09 to .10.

The correlations between perceived control over pollution (air, garbage and water) and problem-focused coping for pollution was found to be positive for all groups. The magnitude of correlation between perceived control over air pollution and problem-focused coping for it was found to be the highest ($r = .33$) for male group and the lowest for migrant group ($r = .10$). In the case of correlation between perceived control over garbage and problem-focused coping for it, the magnitude was found to be the highest ($r = .43$) for male group and the lowest ($r = .09$) for female and Bahal groups. The correlation between perceived control over water pollution and problem-focused coping for it ranged from .13 to .26 in different groups. The highest correlation was found to be for non-migrant group and the lowest for male group.

The nature of correlations between perceived control over pollution (air, garbage and water) was different for all groups. The correlations between perceived control over air pollution and emotion-focused coping (for it) was found to be negative ($r = -.25$) for female, Bahal, and non-migrant groups, whereas positive relationships were found to be for male, non-Bahal and migrant groups (the correlation ranged from .02 to .15). The correlation between perceived control over garbage and emotion-focused coping related

to it was positive for male and non-Bahal groups ranging the correlation from .16 to .25. Whereas the relationships between perceived control over garbage pollution and emotion-focused coping related to it were negative for female, Bahal, migrant and non-migrant groups (the correlation ranged from -.25 to -.27). Similarly, the relationship between perceived control over water pollution and problem-focused coping for it was low and negative for all groups, except for male sample that showed positive relationship. The magnitude of correlation was found to be the highest ($r = .29$) for male sample.

The Tables further reveal that the relationship between experienced pollution stress and problem-focused coping for pollution was found to be positive. The correlation between experienced air pollution stress and problem-focused coping was found to be the highest ($r = .44$) for Female and Bahal groups and the lowest ($r = .34$) for migrants.

Similarly, the correlation between experienced garbage stress and problem-focused coping was found to be higher ($r = .32$) for male group and lower ($r = .17$) for non-Bahal group than other groups. The magnitude of correlation between experienced water pollution stress and problem-focused coping for it ranged from .14 to .33. The highest correlation between experienced garbage stress and problem-focused coping for dealing with water pollution was found for males and the lowest for migrants.

The Tables further show that the correlations of experienced pollution stress with emotion-focused coping for pollution were positive for all groups. The Tables reveal that the magnitude of correlation between experienced air pollution stress and emotion-focused coping for air pollution was higher ($r = .39$) in migrant group than in other groups and was the lower ($r = .33$) in males, non-Bahal and non-migrant groups. The correlation between experienced garbage stress and emotion-focused coping for garbage pollution was found to be higher ($r = .42$) in migrant group and the lower for the male group than in other groups. The correlations of experienced water pollution stress with emotion-focused coping for water pollution ranged from .20 to .44. The highest correlation between experienced water stress and emotion-focused coping (for it) was found in non-Bahal group and the lowest in male group.

Section B

This section reports the mean differences, with F ratios based on MANCOVA, of the different subgroups, i.e., gender, location (Bahal and Non-Bahal), and type of residential status (non-migrants and migrants) after statistically controlling the effect of respondents' age, education, and family income. Two-way interactions of gender and location, gender and residential status, and location and residential status are also presented.

Gender Differences in Perception of Intensity, Control, experienced Stress, Coping and Health

To see the over all gender differences on dependent variables, one way multiple analysis of covariance was computed. Age, education, and family income were covariates (see Table 27). The result of MANCOVA revealed that gender was a significant factor for over all differences, Wilks' $\Lambda = .846$, $F(18, 187) = 1.89$, $p < .05$. One way univariate analysis of covariance was computed after getting significant MANCOVA results as suggested by Spector (1977) to see the individual contribution of each dependent variable to the significant MANCOVA main effects for gender. Table 27 presents the cell means and F ratios for males and females. Results of Table 27 portray the significant gender difference for problem-focused coping to water pollution, emotion-focused water pollution, and psychological health after statistically controlling the effects of respondents' age, education, and family income of the respondents. It implies that males and females differ in coping strategies (problem-focused and emotion-focused) to deal with water pollution and also in psychological health. Females respondents reported more problem-focused and emotion-focused coping strategies to water pollution and they also reported more symptoms related to psychological health than male respondents.

Table 27 Means and ANCOVAs for Gender, after Controlling the Effect of Age, Education and Family Income.

VARIABLES	Main Effects		
	Gender		
	Male	Female	F(1,204)
Intensity of Air Pollution	8.88	8.45	1.33
Intensity of Garbage	9.68	9.32	.84
Intensity of Water Pollution	8.77	8.15	1.79
Control over Air Pollution	7.30	7.59	.57
Control over Garbage	11.72	11.83	.05
Control over Water Pollution	9.09	9.64	2.45
Air Pollution Stress	10.21	10.64	1.20
Garbage Stress	10.51	10.48	.01
Water Pollution Stress	11.61	11.43	.21
Problem-Focused Coping for			
• Air Pollution	8.79	8.97	.33
• Garbage	9.39	9.87	2.16
• Water Pollution	10.38	11.46	10.59***
Emotion-Focused Coping for			
• Air Pollution	9.48	9.69	.49
• Garbage	9.27	9.87	3.60
• Water Pollution	8.70	9.45	6.54**
Life Events	15.92	15.76	.49
Physical Health	44.13	47.01	3.15
Psychological Health	30.98	33.71	4.82*

MANCOVA, Wilks' Λ = .846, F (18, 187) = 1.794*

*p < .05, **p < .01, ***p < .001.

Table 28 Means and ANCOVAs for Location and for Residential Status, after Controlling the Effect of Age, Education and Family Income

VARIABLES	Main Effects Location			Main effects Residential Status		
	Bahal	Non-Bahal	F (1,204)	Native	Migrant	F (1,204)
Intensity of Air Pollution	8.63	8.68	.02	8.20	9.18	6.86**
Intensity of Garbage	9.83	9.15	3.50	9.42	9.57	15
Intensity of Water Pollution	8.70	8.20	1.36	8.60	8.30	42
Control over Air Pollution	7.47	7.43	.01	7.61	7.29	69
Control over Garbage	12.24	11.29	4.90*	12.17	11.34	3.30
Control over Water Pollution	9.72	9.03	4.39*	9.78	8.94	5.75*
Air Pollution Stress	10.24	10.63	1.16	10.10	10.83	3.50
Garbage Stress	10.56	10.43	11	10.23	10.82	1.94
Water Pollution Stress	11.59	11.44	17	11.41	11.65	40
Problem-Focused Coping for						
• Air Pollution	9.06	8.70	1.35	8.70	9.06	1.32
• Garbage	9.72	9.54	31	9.87	9.36	2.74
• Water Pollution	10.86	11.01	22	10.83	11.04	41
Emotion-Focused Coping for						
• Air Pollution	9.45	3.72	1.10	9.45	9.27	93
• Garbage	9.33	9.84	2.98	9.57	9.60	02
• Water Pollution	7.77	9.36	3.20	8.82	9.42	4.46*
Life Events	15.97	15.71	1.53	15.86	15.84	00
Physical Health	44.17	47.18	3.96*	44.82	46.56	1.13
Psychological Health	31.29	33.58	3.85*	31.14	33.86	4.78*
MANCOVA, Wilks' Λ = 856, F (18, 187) = 1.75*				MANCOVA, , Wilks' Λ = 855 F (18, 187) = 1.76*		

*p < .05, **p < .01, ***p < .001

Location Differences in Perception of Intensity, Control, experienced Stress, Coping and Health

One way multiple analysis of covariance was computed to see the over all location differences on dependent variables. Age, education and family income were covariates for these analyses (see Table 28). The result of MANCOVA revealed that location was a significant factor, Wilks's $\Lambda = .856$, $F(18, 187) = 1.75$, $p < .05$, for over all differences. One way univariate analysis of covariance was computed to see the individual contribution of each dependent variable to the significant MANCOVA main effects for location. Table 28 presents the cell means of two locations (Bahal and Non-Bahal) and F ratios on several variables related to environmental pollution. Table contents show that perceived control over garbage and water pollution, and physical and psychological health significantly differed in two neighbourhoods, after statistically controlling the effect of respondents' age, education and income. The cell means revealed that the respondents in Bahal perceived more control over garbage and water pollution than the respondents in non-Bahal. But non-Bahal respondents reported more physical and psychological health problems than the respondents in Bahal.

Residential Status Differences in Perception of Intensity, Control, Experienced Stress, Coping and Health

One way multiple analysis of covariance was computed to see the over all residential status (migratory or no-migratory) differences on dependent variables. Age, education and family income were covariates for these analyses (see Table 28). The result of MANCOVA revealed that residential status was a significant factor, Wilks's $\Lambda = .855$, $F(18, 187) = 1.70$, $p < .05$, for over all differences. One way univariate analysis of covariance was computed to see the individual contribution of each dependent variable to the significant MANCOVA main effects for residential status. Table 28 shows the cell means of non-migrants and migrants and also F ratios on several variables. The Table contents reveal that the migrants and the non-migrants significantly differed on various perceived variables, e.g., perceived intensity of air pollution, perceived control over water pollution, emotion-focused coping for water pollution, and psychological health after statistically

controlling the effect of respondents' age, education, and income. The migrants perceived more intensity of air pollution than the non-migrants. The non-migrants reported greater amount of control over water pollution than the migrants. The migrants used more emotion-focused coping to water pollution than non-migrants. On the other hand, the migrants reported greater amount of symptoms of psychological health than non-migrants.

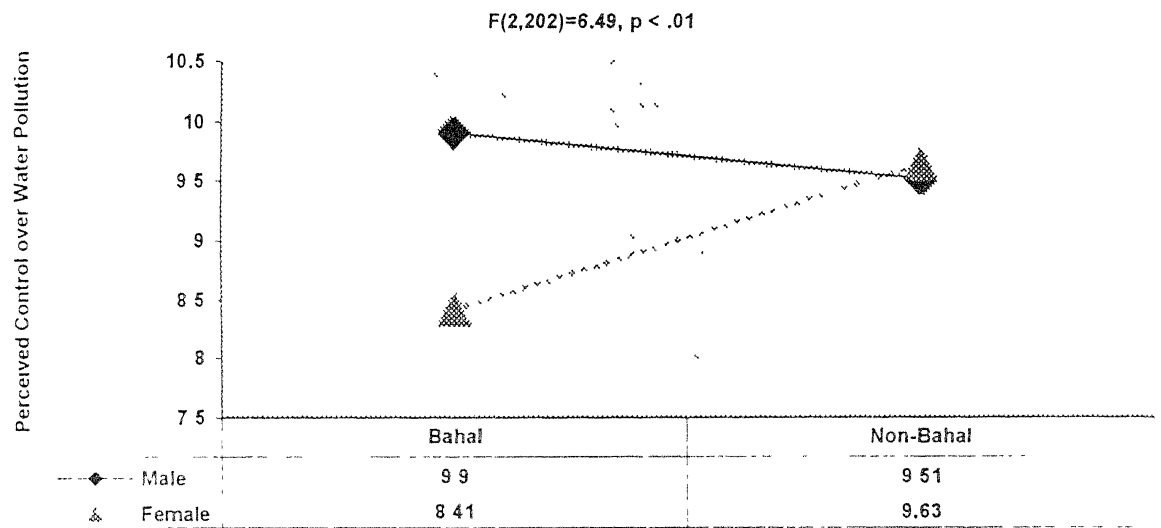


Figure 1. Perceived Control over Water Pollution as a function of Two-way Interaction of Gender and Location.

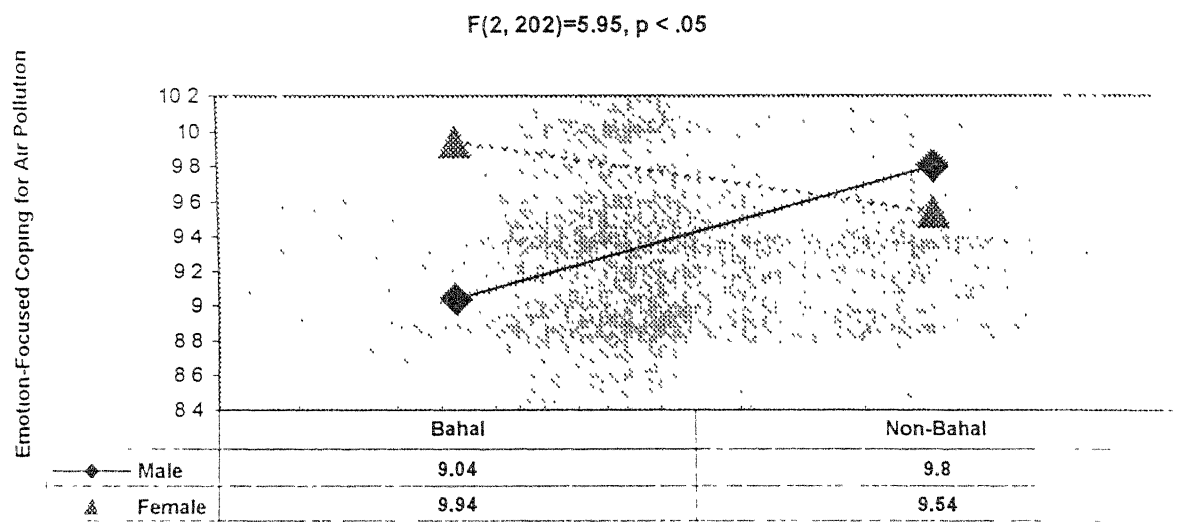


Figure 2. Emotion focused coping to Air pollution as a function of two-way Interaction of Gender and Location.

Two-way Interactions of Gender and Location Differences

Two-way interactions of gender and location were found to be significant only for the perceived control of water pollution and emotion-focused coping to air pollution after statistically controlling the effect of age, education and family income of the respondents. Figure 1 shows that males of Bahal perceived greater control over the polluted water than females of Bahal, but females of Non-Bahal perceived greater control over the polluted water than males of Non-Bahal. Males of Bahal perceived greater control over the water pollution than males of non-Bahal, while females of non-Bahal perceived greater control over the water pollution than the females of Bahal. Males of Bahal perceived greater control over polluted water than males of Bahal and females of Bahal and non-Bahal.

Figure 2 shows that females of Bahal reported that they used more emotion-focused coping strategies to deal with air pollution than females of non-Bahal and males of Bahal and non-Bahal, whereas males of non-Bahal used more emotion-focused strategies than females of non-Bahal. Males of non-Bahal used more emotion strategies to cope with the air pollution than males of Bahal.

Two-way Interactions of Gender and Residential Status Differences

Two-way interactions of gender and residential status were found to be significant only for experienced air pollution stress and problem-focused coping to water pollution. Figure 3 depicts that both non-migrant and migrant females experienced more air pollution stress than non-migrant and migrant males. Migrant males experienced more stress related to air pollution than non-migrant males. However, non-migrant females experienced greater stress related to air than migrant females.

Figure 4 portrays the interaction effect of gender and residential status for problem-focused coping for water pollution. The figure shows that the migrant males used more problem-focused coping strategies to deal with polluted water than the non-migrant males, while the non-migrant females used more problem-focused coping strategies to deal with water pollution than the migrant females. The non-migrant females used more

problem-focused strategies to cope with water pollution than the non-migrant males, but the migrant males used more problem-focused strategies than the migrant females

Two-way Interaction of Location and Residential Status Differences

The Two-way interactions of location and residential status reached to the significance level only for the emotion-focused coping to polluted air. Figure 5 reveals that the migrants in Bahal used more emotion-focused coping strategies than the non-migrant in Bahal, whereas the non-migrants in non-Bahal used slightly more emotion-focused coping strategies than the migrants in non-Bahal. The non-migrants in non-Bahal used more emotion-focused strategies to cope with polluted air than the non-migrant in Bahal, but the migrants in Bahal used more emotion-focused coping for air pollution than the migrants in non-Bahal.

$F(2,206)=5.23, p<.05$

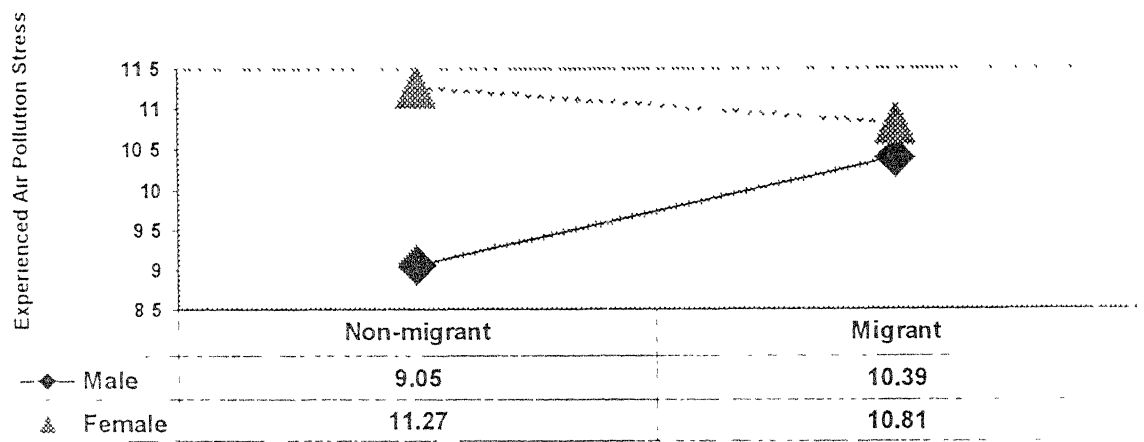


Figure 3. Experienced Air pollution Stress as a function of Two-way interaction of Gender and Residential Status.

$F(2,202)=10.53, p<.001$

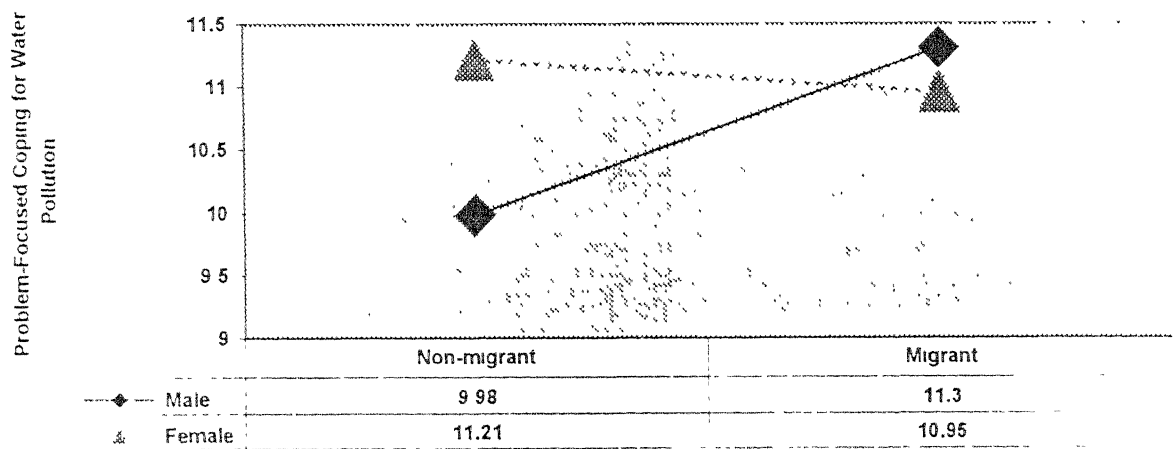


Figure 4. Problem Focused Coping for Water Pollution as a function of Two-way interaction of Gender and Residential Status.

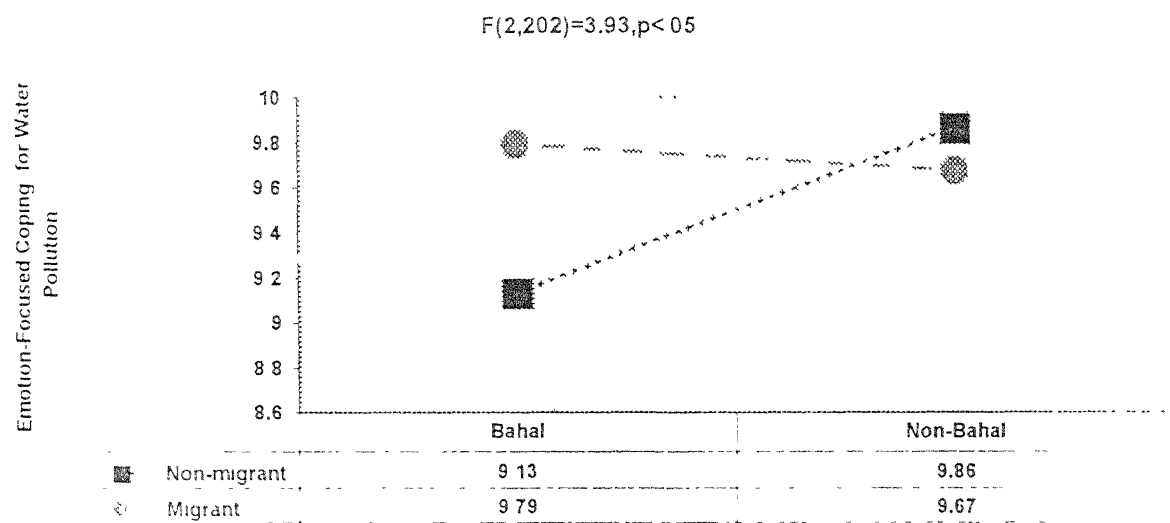


Figure 5. Emotion Focused Coping for Water pollution as a function of Two-way interaction of Location and Residential Status.

Section C

This section presents the results of regression analyses for criterion variables psychological and physical health. Multiple regression analyses was performed in three stages. In the beginning, the regression equation was performed by taking all predictor variables (e.g., $X_1, X_2, X_3, \dots, X_N$) and R^2 were computed. In the second stage, to ascertain the contribution of a group of predictor variables, backward regression analysis was performed. For example, after obtaining overall R^2 (predicted by all predictor variables), a group of variables (e.g., demographic variables like age, education and family income) was removed from the regression equation and R^2 was computed again. The difference between the overall R^2 and the remaining R^2 after removing a group of variables would be the index of contribution of that cluster of variables. This procedure was applied for all groups of variables. There were five such groups of variable namely demographic variables, perceived intensity, perceived control, experienced stress, and life events. Similarly, in the third stage, backward regression analysis was carried out as suggested by Darlington (1968) to determine the significant individual contribution of each predictor variable. The procedure was same as in the second stage of regression analysis. In spite of dropping a group of variables, one predictor variable, e.g., X_1 was dropped each time from the regression equation and R^2 was again calculated. The difference in R^2 would be the index of individual contribution of X_1 . In the same way, another predictor variable, e.g., X_2 , was dropped and R^2 was calculated again by taking the remaining predictor variables. This process was repeated for all predictor variables. According to Cohen (1968), individual contributions of predictor variables throw light on relative salience of the variables that facilitates the process of drawing certain conclusions.

Predictors of Physical Health

For the regression analysis, physical health was the criterion variable and demographic variables like age, education, and income, and perceived variables related to environmental pollution (air, garbage and water) such as perceived intensity, perceived control, and experienced stress, and life events were predictor variables. A set of

regression analyses was performed for different groups separately (e.g., male and female, Bahal and non-Bahal, non-migrant and migrant)

Physical health was predicted differently in male and female groups. When all these predictor variables were entered for the regression equation, they all together explained 27.4% and 28% of variance for physical health in male and female groups respectively (see Table 29). The backward regression analysis was performed for five groups of variables as mentioned earlier, which revealed only one group of variable, i.e., experienced pollution stress, that had significant contribution for predicting physical health for male group when the experienced pollution stress (air, garbage and water) was removed, 8.9% of variance dropped in the total variance explained for physical health (see Table 29). It means the experienced pollution stress, as a group of variables contributed 8.9% of variance in total variance explained for physical health. Similarly, for female group, two significant groups of variables emerged for predicting physical health, perceived intensity of pollution and experienced pollution stress, which explained 6.7% and 9.9% of variance respectively.

Again backward regression analysis was computed to identify the particular significant predictor variable (instead of groups of variables) that had individually contributed for the prediction. The regression analysis revealed only five significant predictor variables for male and only two significant predictor variables for females for predicting physical health (see Table 30). For the male group, age, perceived intensity of water pollution, perceived control over water pollution, experienced air and water pollution stress were the significant predictor variables that accounted for physical health. Each predictor variable was eliminated from the regression equation and R^2 was calculated each time. Thus, the difference between the R^2 would be the relative contribution of each predictor variable. Table 30 shows that experienced air pollution stress emerged as the most important predictor variable for predicting physical health with a significant drop of 7.3%, in the total variance explained. Experienced water pollution stress and perceived intensity of water pollution were the next significant predictor variables, each contributed 4.1% in the total variance explained. Age and perceived control over water pollution individually contributed 3.4% of variance in the total variance explained. For the female group, backward regression analysis identified only perceived control over garbage and water pollution as the significant predictor variables. When these predictor variables

were eliminated from the regression equation, 3.2% and 3.4% of variance dropped respectively in the total amount of variance explained.

Another series of regression analyses was computed for Bahal and non-Bahal groups. The results of regression analyses revealed that physical health was predicted differently for Bahal and non-Bahal groups. All the predictor variables together explained a total amount of 26.4% and 21.8% of variance for physical health in Bahal and non-Bahal groups respectively (see Table 29).

When each group of variable was dropped from the regression equation, two groups of variables, namely perceived intensity of pollution and experienced pollution stress, appeared as the significant contributors for predicting physical health for the Bahal group. Two groups of variables, perceived intensity of pollution and experienced pollution stress, explained 9.3% and 8.5% of variance for physical health respectively in the Bahal group (see Table 29). In the case of the non-Bahal group, only experienced pollution stress and life events emerged as the significant groups of variables when each group of variables was removed from the regression equation. The contribution of experienced pollution stress was the highest among the groups of variables, followed by life events. Experienced pollution stress and life events explained 7.1% and 6.8% of variance for physical health respectively.

Again, backward regression was computed to identify the relative contribution of each predictor variable (see Table 30). For the Bahal group, only two groups of predictor variables, perceived intensity of water pollution and experienced air pollution stress, emerged as significant for explaining physical health by backward regression analysis, each of them contributing 7.0% and 3.7% respectively in the total variance explained for physical health. For the non-Bahal group, backward regression analysis revealed that physical health was significantly predicted by education, air pollution stress, and life events, explaining 3.3%, 4.1%, and 6.8% of variance respectively for the total variance explained. For both Bahal and non-Bahal groups, experienced air pollution stress was a common significant predictor variable. For the Bahal group, perceived intensity of water pollution was the most important predictor variable, but in the case of the non-Bahal group, life events were the most important predictor variable for explaining physical health.

Table 29 Backward Regression Analysis showing R²-change of a Group of Regressing Variables on Physical Health for Different Groups

	Male	Female	Bahal	Non-Bahal	Non-migrant	Migrant
Physical Health	Physical Health	Physical Health	Physical Health	Physical Health	Physical Health	Physical Health
R ² -change	R ² -change	R ² -change	R ² -change	R ² -change	R ² -change	R ² -change
Groups of Predictor Variables						
Demographic Variables (Age, education, Family Income)	058	027	043	047	066*	017
Perceived Intensity of Pollution	057	067*	093**	033	051	047
Perceived Control Over Pollution	063	006	003	034	005	014
Experienced Pollution Stress	089*	088**	085*	071*	113**	068*
Life Events	024	002	001	068**	005	040*
R ² predicted by all predictor Variables together	R ² = .274 F(13,86)= 2.49**	R ² = .28 F(13,95)= 2.84**	R ² = .264 F(13,92)= 2.54**	R ² = .218 F(13,89)= 1.91*	R ² = .224 F(13,96)= 2.13*	R ² = .006 F(13,85)= 2.88**

*p < .05; **p < .01

Table 30 Backward Regression Analyses Showing R² –Change of Regressing Predictor Variables on Physical Health for Different Groups

Predictors	Male R ² change	Female R ² change	Bahal R ² change	Non- Bahal R ² change	Non- migrant R ² change	Migrant R ² change
Age	034*	002	005	004	002	007
Education	001	026	023	033	055**	003
Family Income	004	005	004	006	003	004
Intensity of Air Pollution	011	001	001	015	011	001
Intensity of Garbage Pollution	012	032*	017	001	013	021
Intensity of Water Pollution	041*	034*	070**	016	020	030
Control over Air Pollution	001	004	000	001	004	038*
Control over Garbage pollution	001	005	002	001	002	018
Control over Water Pollution	034*	001	001	011	001	011
Air Pollution Stress	073**	028	037*	041*	075*	009
Garbage Pollution Stress	001	005	005	002	001	027
Water Pollution Stress	041*	001	012	012	004	022
Life Events	024	002	001	068**	005	046*
Over all Predicted by Predictor Variables together	R ² = 274 F(13,86) = 2.49**	R ² = 28 F(13,95) = 2.84**	R ² = 264 F(13,92) = 2.54**	R ² = 218 F(13,89) = 1.91*	R ² = 224 F(13,96) = 2.13*	R ² = 306 F(13,85) = 2.88**

*p < .05; **p < .01

Accordingly, the next series of regression analysis was performed for non-migrant and migrant groups separately, which revealed that all the predictor variables together explained a sum of 22% and 30.6% of variance in explaining physical health respectively (see Table 29). After elimination of each group of variables from the regression equation, demographic variable and experienced pollution stress appeared as significant for predicting physical for non-migrant group. Demographic variable and experienced pollution stress explained 5.6% and 11.3% of variance for physical health respectively (see Table 29). For the migrant group, experienced pollution stress and life events emerged as the significant groups of variables for predicting physical health when groups of variables was dropped individually from the regression equation. Experienced pollution stress explained 6.8% of variance followed by life events that explained 4.6% of variance for physical health.

To get individual and relative contribution of each predictor variable, a set of regression was carried out (see Table 30). For the non-migrant group, backward regression analysis identified only two predictor variables, education and experienced air pollution stress, as the significant ones accounting for 5.5% and 7.5% of variance for physical health respectively. For the migrant group, only two significant predictor variables perceived control over air pollution and life events, were revealed by backward regression, which contributed 4.6% and 3.8% of variance respectively in the total variance explained for physical health.

Predictors of Psychological Health

For criterion variable psychological health, demographic variables such as age, education, and family income, perceived variables related to environmental pollution (air, garbage, and water) such as perceived intensity, perceived control, experienced stress, and life events were entered for regression equation. Separate regression analyses were carried out for different groups as mentioned earlier for physical health. The Table 31 shows that psychological health was predicted differently by the male and female groups. All together these predictor variables explained 25.4% and 24% of variance for psychological health for male and female groups respectively. Backward regression analysis was computed to identify the relative contribution of each group of variables.

namely demographic, perceived intensity, perceived control, experienced stress, and life events for explaining psychological health for different groups (see Table 31). When each group of variables was dropped from the regression equation, two groups of variables, experienced pollution stress and life events emerged as significant, accounting for 6.9% and 3.9% of variance for predicting psychological health respectively for males. In the case of females, no group of variable reached the significance level.

Backward regression analysis was again computed to identify the particular significant predictor variable that explained the variance for psychological health. Regression analysis revealed only two significant predictor variables, experienced air pollution stress and life events, which had significant contribution in explaining the variance of physical health for the male group (see Table 32). After eliminating each predictor variable from the regression equation, experienced air pollution stress and life events emerged as the most important predictors having a drop of 6.7%, and 3.9% respectively in the total variance explained for psychological health. For the female group, only two predictor variables, age and perceived intensity of air pollution, were found to be significant for predicting psychological health. When each significant predictor was removed from the regression equation, the relative contribution of age and perceived intensity of air pollution appeared with a significant drop of 5.7% and 4.1% respectively in the total variance explained for psychological health.

Another series of regression analyses was computed separately for Bahal and non-Bahal groups. In Bahal group, a total of 27.7% of variance was accounted for psychological health by the entire predictor variables together, but R^2 predicted for non-Bahal group was not significant (see Table 31). To know the predictive power of each group of variables, backward regression analysis was carried out that identified only demographic variables as significant for the Bahal group. Demographic variables explained 8.9% of variance for psychological health. Again, backward regression was computed to identify the particular predictor variable that significantly explained the variance for psychological health (see Table 32). In Bahal group, backward regression revealed only two significant predictor variables, education and experienced air pollution stress, relatively contributing 7% and 4.7% of variance for the total variance explained for psychological health.

Table 31 Backward Regression Analysis showing R²-change of a Group of Regressing Variables on Psychological Health for Different Groups

	Male	Female	Bahal	Non-Bahal	Non-migrant	Migrant
Predictor	Psychological Health R ² -	Psychological Health R ² -	Psychological Health R ² -	Psychological Health R ² -	Psychological Health R ² -	Psychological Health R ² -
Grouping Variables	change	change	change	change	change	change
Demographic Variables (Age, education, Family Income)	044	050	089**	009	091**	004
Perceived Intensity of pollution	027	051	.042	032	039	021
Perceived Control Over Pollution	.068	020	005	090*	006	100**
Experienced Pollution Stress	069*	020	055	015	044	016
Life Events	039*	001	014		012	032
R ² predicted by all predictor Variables together	R ² = 254 F(13,86)= 2.26*	R ² = 240 F(13,95)= 2.31**	R ² = 277 F(13,92)= 2.71**	R ² = 200 F(13,89)= 1.72 ns	R ² = 229 F(13,96)= 2.20*	R ² = 190 F(13,85)= 1.53 ns

*p < .05; **p < .01

Table 32 Backward Regression Analyses Showing R²-Change of Regressing Predictor Variables on Psychological Health for Different Groups

Predictors	Male R ² change	Female R ² change	Bahal R ² change	Non- Bahal R ² change	Non- migrant R ² change	Migrant R ² change
Age	.011	.057**	.004	.004	.009	.000
Education	.003	.018	.070**	.003	.090***	.000
Family Income	.010	.002	.014	.001	.000	.003
Intensity of Air Pollution	.004	.041*	.027	.008	.032*	.003
Intensity of Garbage Pollution	.027	.017	.006	.031	.021	.019
Intensity of Water Pollution	.000	.002	.006	.000	.001	.002
Control over Air Pollution	.018	.011	.003	.055*	.005	.043
Control over Garbage pollution	.014	.018	.001	.066**	.000	.080**
Control over Water Pollution	.021	.001	.002	.000	.001	.000
Air Pollution Stress	.067**	.009	.047*	.005	.043*	.010
Garbage Pollution Stress	.006	.017	.003	.009	.008	.005
Water Pollution Stress	.025	.001	.026	.001	.006	.007
Life Events	.039*	.001	.014	.005	.012	.032
Over all R ²	R ² = .254	R ² = .240	R ² = .277	R ² = .200	R ² = .229	R ² = .190
Predicted by all Predictor Variables together	F(13,86) = 2.26*	F(13,95) = 2.31**	F(13,92) = 2.71**	F(13,89) = 1.72 ns	F(13,96) = 2.20*	F(13,85) = 1.53 ns

*p < .05; **p < .01; ***p < .001; ns = not significant

The next set of regression analyses was computed for non-migrant and migrant groups. Table 31 reveals that all the predictor variables together predicted 22% of total variance in explaining psychological health for non-migrant group, but the R^2 was not significant for migrant group. When each group of variables was removed from the regression equation, only demographic variable appeared as significant for non-migrant group (see Table 31), dropping 9.1% in the total variance explained for psychological health.

Further, backward regression was computed again to identify the particular predictor variable that had significant contribution for predicting psychological health (See Table 32). For non-migrant group, education, perceived intensity of air pollution, and experienced air pollution stress were identified as the significant predictor variables by backward regression analysis. Education emerged as the most important predictor variable, which explained 9% of variance for psychological health. Experienced air pollution stress and perceived intensity air pollution explained 4.3% and 3.2% of variance for psychological health respectively.

Predictors of Emotion-Focused Coping Strategies

A set of regression analysis was computed separately for different groups. Emotion-focused and Problem-focused coping for pollution were the criterion variables, and demographic variables (age, education and family income), perceived intensity, control and experienced stress associated with air, garbage and water pollution were predictor variables.

Backward regression analysis was carried out as mentioned earlier. All the predictor variables together explained 43% and 35.3% of variance for emotion-focused coping related to pollution for male and female groups respectively (see Table 33). When groups of predictor variables removed from the regression one by one, perceived control over pollution, and experienced pollution stress emerged as the most significant groups of variables having drop of 13.6% and 9% respectively in the total variance explained for emotion-focused coping for male groups. In the case of female group, only experienced pollution stress appeared as the most significant group of variables, with a drop of 8% in the total variance explained for emotion-focused coping.

Table 33 Backward Regression Analysis showing R²-change of a Group of Regressing Variables on Emotion-Focused Coping for different Groups.

		Male	Female	Bahal	Non-Bahal	Non-migrant	Migrant
Grouping Variables	Predictor	R ² -change	R ² -change	R ² -change	R ² -change	R ² -change	R ² -change
Demographic (Age, education, Family Income)		005	047	007	018	009	019
Perceived Intensity of pollution		014	030	013	054*	045	028
Perceived Control over Pollution		136***	043	057	073*	076**	063*
Experienced Pollution Stress		090**	080**	127***	098**	124***	112**
R ² predicted by all predictor Variables together		R ² = 430 F(12,87) =5.47***	R ² = 353 F(12,96) =4.36***	R ² = 312 F(12,93) =3.52***	R ² = 410 F(12,90) =5.20***	R ² = 399 F(12,97) =5.37***	R ² = 350 F(12,86) =3.85***

*p < .05; **p < .01; ***p < .001

Table 34 Backward Regression Analysis Showing R²-change of Regressing Predictor Variables on Emotion-Focused Coping for Different Groups.

	Male	Female	Bahal	Non-Bahal	Non-Migrant	Migrant
Predictors	R ² -change	R ² -change	R ² -change	R ² -change	R ² -change	R ² -change
Age	004	019	000	015	004	015
Education	001	010	001	000	001	005
Family Income	001	034*	004	004	004	000
Perceived Intensity of						
• Air Pollution	010	007	001	020	000	027
• Garbage Pollution	000	009	005	006	031*	006
• Water Pollution	004	007	005	015	008	003
Perceived Control over						
• Air Pollution	000	007	004	040*	002	045*
• Garbage Pollution	083***	032*	046*	052**	051**	039*
• Water Pollution	000	035*	000	003	001	000
Experienced Stress						
• Air Pollution	041*	001	051*	000	054**	006
• Garbage Pollution	.003	000	009	002	020	003
• Water Pollution	003	001	.011	.062**	.017	022
Over all R ² Predicted by all Predictors together	R ² = .430 F(12,87) =5.47***	R ² = .353 F(12,96) =4.36***	R ² = .312 F(12,93) =3.52***	R ² = .410 F(12,90) =5.20***	R ² = .399 F(12,97) =5.37***	R ² = .350 F(12,86) =3.85***

*p < .05; **p < .01; ***p < .001

To get the individual contribution of predictor variables, a set of regression analysis was performed (see Table 34). For male groups, only perceived control over garbage and experienced air pollution stress emerged as the significant predictor variables for the prediction of emotion-focused coping, contributing 8.3% and 4.1% respectively in the total variance explained. For female group, only family income, perceived control over garbage and water pollution appeared as the significant variables for the prediction of emotion-focused coping, contributing 3.4%, 3.2% and 3.5% in the total variance explained.

Further, a series of regression was computed for Bahal and non-Bahal groups separately. All the predictor variables accounted for a total of 31.2% and 41% of variance for emotion-focused coping in Bahal and non-Bahal groups respectively. Backward regression was performed to find out the relative importance of groups of variables. When each group of variables were eliminated separately from the regression equation, perceived control and experienced stress related to pollution appeared as the most important predictor variables, with a significant drop of 5.7% and 12.7% respectively in the total variance explained for emotion-focused coping in the Bahal group. In the non-Bahal group, perceived intensity, perceived control and experienced stress related to pollution appeared as important predictors having a significant drop of 5.4%, 7.3% and 9.8% respectively in the total variance explained.

The individual contribution of each predictor variable for the prediction of emotion-focused coping was determined by a set of backward regression analysis. For Bahal group, backward regression analysis revealed that perceived control over garbage pollution and experienced air pollution stress were significant variables for predicting emotion-focused coping, with the individual contribution of 4.6% and 5.1% in the total variance explained. Similarly, for non-Bahal group, backward regression analysis identified three significant predictor variables, perceived control over air and garbage pollution and experienced water pollution stress, which contributed 4%, 5.2% and 6.2% in the total variance explained for emotion-focused coping respectively.

The next set of regression was computed for migrant and non-migrant groups, which revealed that all the predictor variables accounted for a total of 35% and 39.9% of variance for emotion-focused coping respectively. Backward regression was performed to find out the relative importance of each group of variables. The Backward regression confirmed that for non-migrant groups, perceived control and experienced stress associated with pollution were the most important groups of predictor variables, with significant drop of 7.6% and 12.4% respectively in the total variance explained when each group of variables was removed from regression. Also for the migrant group, perceived control and experienced stress related to pollution were the most important groups of variables having drop of 6.3% and 11.2% respectively in the total variance explained when groups of predictors were eliminated from the regression equation one by one.

Further, a series of backward regression was performed to obtain the individual contribution of predictors, which identified perceived intensity of garbage, perceived control over garbage and experienced air pollution stress as the significant predictors for non-migrant group, with the contribution of 3.1%, 5.1% and 5.4% respectively in the total variance explained. For migrant group, perceived control over air and garbage pollution emerged as the most important predictors with the significant contribution of 4.5% and 3.9% respectively in the total variance explained for emotion-focused coping.

Predictors of Problem-Focused Coping

A series of regression analysis was computed separately for different groups to find out the relative importance of predictor variables for explaining problem-focused coping (see Tables 35). The predictor variables were same as discussed earlier in the case of emotion-focused coping. All the predictor variables together accounted for a sum of 30.7% and 54.8% of variance for problem-focused coping for male and female groups respectively. Backward regression was computed to find out the relative importance of groups of variables. The regression identified only perceived control over pollution as the most important group of predictor variables for the male group, with a drop of 14.6% in the total variance explained for problem-focused coping when each group of predictor variables was eliminated from the regression equation. For the female group, all groups of predictor variables, i.e., demographic and perceived intensity, control and experienced stress related to pollution, were determined by backward regression as significant. Table

35 shows that among the groups of predictor variables, experienced pollution stress and demographic variables emerged as the most important with significant drop of 13.8% and 10.9% respectively, followed by perceived control and perceived intensity of pollution, which had significant drop of 6.3% and 6.2% in the total variance explained respectively when they were removed from the regression equation.

Further, to obtain individual contribution of predictor variables, the next set of regression analysis was performed, which confirmed that for the male group, perceived control over water pollution was the single significant predictor contributing 7.1% in the total variance explained (see Table 36). For the female group, backward regression identified three predictor variables as significant, they are, experienced water pollution stress, education and perceived intensity of air pollution, which contributed 11.4%, 9.2% and 4.7% respectively in the total variance explained for problem-focused coping (see Table 36).

For Bahal and non-Bahal groups, all the predictor variables together accounted for 40.8% and 43.8% of variance for problem-focused coping respectively (see Table 35). Background regression revealed that the three groups of variables, demographic, perceived control and experienced stress, were significant for accounting for problem-focused coping in Bahal group. When each group of predictor variables was removed from the equation, there was a significant drop of 6%, 6.5% and 12.7% respectively in the total variance explained. For non-Bahal group, perceived experienced stress, intensity and perceived control were identified as the important groups of variables. The total variance accounted for problem-focused coping dropped significantly by 5.3%, 7.7% and 20.4% respectively as each of them was removed from the regression equation (see Table 35).

Another series of regression was computed to identify the individual contribution of predictor variables. In the Bahal group, backward regression confirmed only two significant predictor variables, education and perceived control over water pollution, which contributed 5.4% and 5.3% respectively in the total variance accounted for problem-focused coping. In the non-Bahal group, perceived intensity of air pollution, perceived control over air pollution and experienced water pollution stress were determined by backward regression as significant variables contributing 2.8%, 3.4% and 4.2% respectively in the total variance explained (see Table 36).

Table 35 Backward Regression Analysis Showing R²-change of Regressing Predictor Variables on Problem-Focused Coping for Different Groups.

	Male	Female	Bahal	Non-Bahal	Non-migrant	Migrant
Grouping Predictor Variables	R ² -change	R ² -change	R ² -change	R ² -change	R ² -change	R ² -change
Demographic (Age, education, Family Income)	.043	.109***	.060*	.031	.066*	.030
Perceived Intensity of pollution	.027	.062**	.015	.077**	.004	.135***
Perceived Control Over Pollution	.146***	.063**	.065*	.204***	.056*	.142***
Experienced Pollution Stress	.041	.138***	.127***	.052*	.087**	.121***
R ² predicted by all predictor Variables together	R ² = .307 F(12,87) =3.22***	R ² = .548 F(12,96) =9.70***	R ² = .408 F(12,93) =5.35***	R ² = .438 F(12,90) =5.84***	R ² = .394 F(12,97) =5.26***	R ² = .463 F(12,86) =6.18***

*p < .05; **p < .01; ***p < .001

Table 36 Backward Regression Analysis Showing R²-change of Regressing Predictor Variables on Problem-Focused Coping for Different Groups.

	Male	Female	Bahal	Non-Bahal	Non-Migrant	Migrant
Predictors	R ² -change	R ² -change	R ² -change	R ² -change	R ² -change	R ² -change
Age	.008	.027	.000	.016	.000	.019
Education	.014	.092***	.054**	.022	.058**	.016
Family Income	.004	.000	.001	.001	.004	.000
Perceived Intensity of						
• Air Pollution	.005	.047**	.013	.028*	.001	.088***
• Garbage Pollution	.002	.000	.000	.011	.001	.008
• Water Pollution	.005	.005	.000	.004	.002	.005
Perceived Control over						
• Air Pollution	.002	.007	.003	.034*	.000	.017
• Garbage Pollution	.000	.001	.014	.005	.001	.001
• Water Pollution	.071**	.023	.053**	.009	.042*	.043*
Experienced Stress						
• Air Pollution	.003	.011	.001	.014	.003	.029*
• Garbage Pollution	.019	.001	.006	.006	.006	.002
• Water Pollution	.010	.114***	.063**	.042**	.026*	.103***
Over all R ² Predicted by all Predictors together	R ² = .307 F(12,87) =.322***	R ² = .548 F(12,96) =.970***	R ² = .408 F(12,93) =.535***	R ² = .438 F(12,90) =.584***	R ² = .394 F(12,97) =.526***	R ² = .463 F(12,86) =.618***

*p < .05; **p < .01; ***p < .001

For non-migrant and migrant groups, all the predictor variables explained a total of 39.4% and 46.3% of variance for problem-focused coping respectively (see Table 35). Among the groups of variables demographic, perceived control and experienced stress related to pollution were found significant for non-migrant group. When each of these groups of variables was eliminated from the regression, there was significant drop of 6.6%, 5.6% and 8.7% respectively in the total variance explained. For migrant group, The regression determined perceived intensity, perceived control and experienced stress related to pollution as important groups of variables, with significant drop of 13.5%, 14.2% and 12% respectively in the total variance explained.

Backward regression was further performed to find out the individual contribution of predictor variables. For the non-migrant group, perceived control over and experienced stress related to water pollution were found as the significant predictors, with the respective contribution of 4.2% and 2.6% in the total variance explained. For the migrant group, perceived intensity of air pollution, perceived control over water pollution, and experienced stress associated with air and water pollution appeared as significant predictors, which contributed 8.8%, 4.3%, 2.9%, and 10.3% respectively in the total variance explained for problem-focused coping.

CHAPTER 4: DISCUSSION

Discussion

The increasing pressure on public amenities due to fast rising population combined with mismanagement, most of the urban centres like Kathmandu have serious negative environmental consequences related to pollution of air, garbage, water and of many other kinds. Due to rapid decline of the environmental conditions, health (physical and psychological) and well being of people are getting seriously negatively affected. The findings of this research reveal linkages in the urban residents' perception of environmental conditions, their experienced stress, their coping strategies, and their health. The findings provide insights in understanding of environmental problems of Kathmandu City.

Figure 6 shows the schematic presentation of variables. The figure presents the background characteristics of the respondents influencing their perception of environmental pollution. The figure further presents the interrelated perceptual variables, e.g., perceived intensity of pollution, perceived control over it, and experienced pollution stress, are related to each other. Further, the flow chart of the variables shows that respondents' perception of environmental pollution (perceived intensity, perceived control, and experienced stress) are associated with their coping strategies and health. Health status of respondents has close linkages with their coping strategies. Respondents' life events are also associated with their health condition. The findings are discussed in terms of above description such relationships of the variables.

This chapter summarises the main findings of the study with suitable explanations. First, the findings related to relationships among the main variables are presented and interpreted. In the second section, differences due to gender, location, and residential status are discussed. Finally, the results of multiple regression analyses are examined to understand the possible predictive relationships among variables.

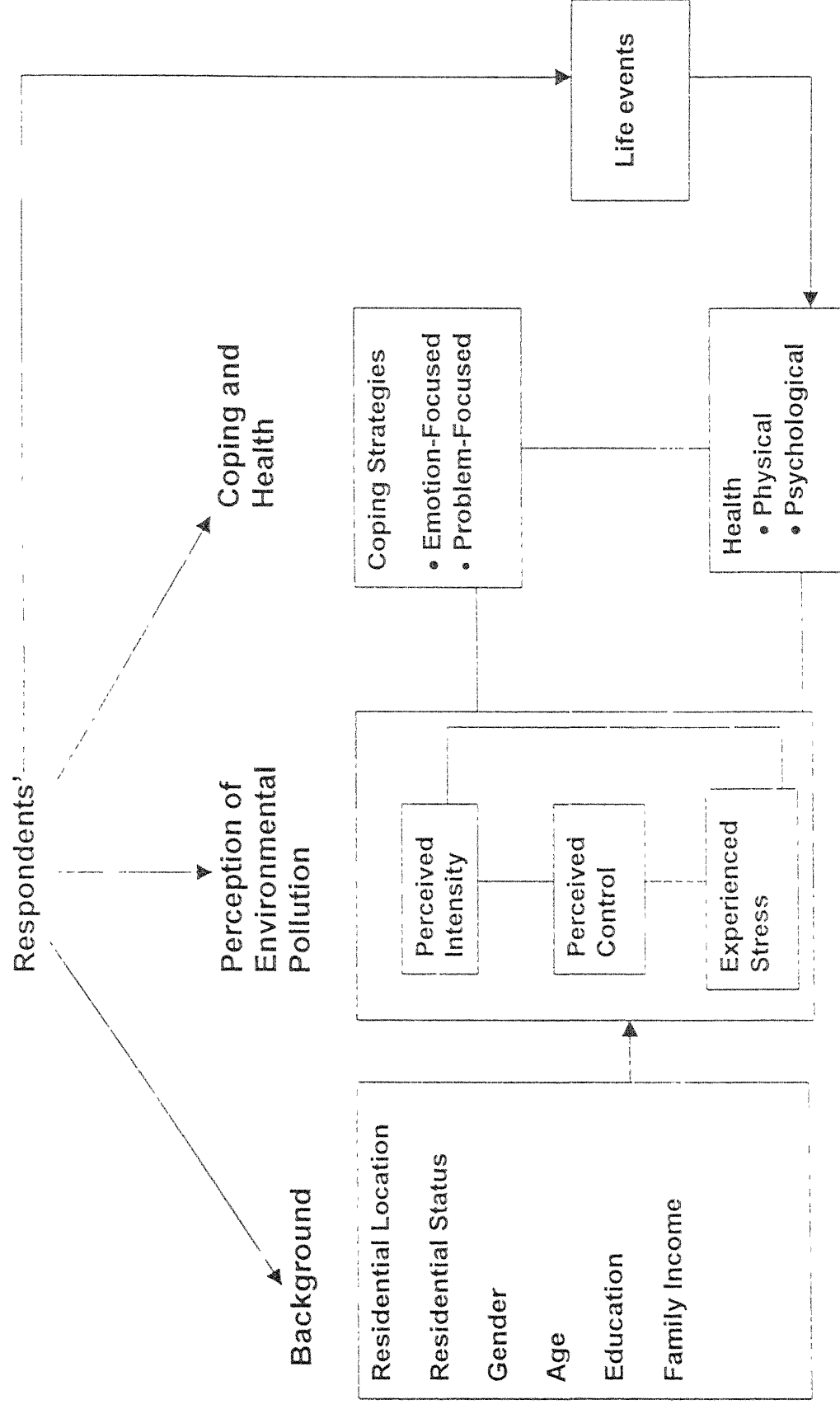


Figure 6. Schematic Presentation of Variables

Relationships between Demographic and Pollution Related Variables

People do differ in their perception of the same environmental condition. As discussed in the introduction section, individual's background characteristics such as age, educational level, and income are important sources for variations in perception of environmental conditions and reactions. The results show that age was found to be significantly negatively correlated with perceived intensity of air pollution for both genders (males and females) (Table 15), and for Bahal group (Table 16). The findings suggest that increasing age of males and females, in general, and Bahal respondents of both genders perceived lesser intensity of air pollution. The findings also reveal that age was significantly negatively related with perceived control over air pollution in case of female in general and in the respondents of Bahal and non-migrant groups. It implies that ageing females, and ageing Bahal and non-migrant respondents irrespective of genders reported lesser amount of perceived control over air pollution. The association between age and experienced stress was found to be negative across air, garbage and water pollution (Table 15, 16 & 17). The findings also suggest that age has significant negative relationships with problem-focused coping strategies for pollution. The findings indicated that people with increasing age, in general, used lesser amount of problem-focused coping strategies to deal with pollution. But in contradiction to these findings, age had significant positive relationship with problem-focused coping for water pollution for non-Bahal group, implying that individuals with increasing age used greater amount of problem-focused coping to deal with water pollution. The findings support the hypothesis (H_1) that higher the age of the respondents, lesser was the perception of intensity, control, experienced stress, and lesser use of problem focused coping strategy to deal with air pollution. But in the case of garbage and water pollution the hypothesis is partly supported. Age had significant negative correlations with experienced stress associated with garbage and water pollution. Thus, the findings imply that with the increase in age of respondents, there was a decrease in their experience of environmental stress. The environment is a sneaky problem, because people adapt to them overtime. According to the adaptation level theory, immediate or previous exposures to a highly intense environmental conditions will cause a habituation process wherein, current judgements of the intensity of that dimension will be lowered relative to the judgements by others without exposure to that dimension (Helson, 1964; Wohlwill, 1974).

It is a well-known fact that education contributes in changing people's perceptions and behaviours. Education facilitates knowledge regarding the environmental issues as well as it

helps individuals to know and acquire new ways to solve the environmental problems. The results that education was positively correlated with problem focused coping support the above contention. The findings suggest that individuals with increasing educational levels used more problem-focused coping strategies for dealing with the environmental pollution. Thus, the correlational results of education with the coping variables support the hypothesis (H_3) regarding the relationship between education and problem focused coping for pollution. However, the findings do not support the hypothesis formulated for the relationship between education and perceived intensity, and perceived control. The correlations of education with physical and psychological health were found to be negative and significant in some groups. The findings partially supported the hypothesis (H_4) that higher the educational levels of the respondents, lesser were their psychological and physical health problems. Education was found to be significantly negatively correlated with physical health, in general, in male, Bahal and non-Bahal and non-migrant groups. In the case of psychological health, the relationship was significant for male, Bahal, and non-migrant groups (Tables 15, 16 & 17). The findings indicate that with the increase in educational levels of the respondents, there was decrease in the amount of reporting health-related problems. Probably, the educated persons are able to deal with the situation effectively and cared for their health since education provides information regarding hygiene and sanitary as well as prevention of diseases. Based on her study of environmental and economic stressors and health in slums of Delhi and Allahabad, Siddiqui (1997) has recently reported the significant negative correlations between education and psychological and physical health.

In the collectivist society, family income indicates income level for all the family members. They all may enjoy with that income for meeting personal as well as family needs. Family income is also an indicator of social status and prestige. The results do not support the hypothesis (H_5) about the relationships between family income and perceived intensity, perceived control and problem-focused coping for pollution. The correlations between family income and experienced stress related to pollution were found to be negative and significant. The findings partially supported the hypothesis (H_6) that higher the family income lesser was the experienced stress related to pollution. The results revealed the significant negative correlation between family income and experienced air pollution stress for females and non-migrants (see Tables 15 & 17). The correlation between family income and experienced garbage stress also was negative and significant across males and females in general, and for migrants of both genders (see Table 15 & 17). The relationship between family income and experienced water pollution stress was also negative and

significant for female and migrant groups. It implies that with increase of family income of the respondents, there was decrease in the experienced pollution-related stress. Specifically, in the case of females, the findings suggest that family income was crucial in the experience of stress associated with water pollution. The findings may be interpreted that in the Nepalese society, primarily, it has been the responsibility of females to manage water for the family. Therefore, it is appealing that family income is related to the experience of water-related stress for females. To purify water one needs to boil the supplied water or use filter or use some medicines. The respondents with increasing family income might have excess for these resources for water purification and therefore, they may experience lesser water-related stress. The cognitive perspective of stress also suggests that income is one of the components of personal coping resources, therefore, it may moderate the experience of stress (Lazarus & Folkman, 1984a; Lazarus, Scheafer, & Folkman, 1979). In other words, family income is associated with persons' appraisal of the environment as less threatening that may work as coping resources to deal with the problem. Although the situation is demanding, due to personal resources one may perceive that the situation can be handled resulting in perception of the environmental conditions as less stress producing.

The results show that the correlation between family income and emotion-focused coping was significant and negative for females across air, garbage and water pollution (Table 15). In the case of females, it implies that with the increase of family income there was decrease in the use of emotion-focused coping strategies for dealing with pollution. The correlations between family income and emotion-focused coping for water pollution were also negative and significant for non-Bahal and migrant groups. The findings partially support the hypothesis (H_6) regarding the relationship between family income and emotion-focused coping strategies for pollution as negative. The findings suggest that family income is an important factor for overcoming the emotional reactions associated with pollution.

Relationships among the Variables Related to Environmental Pollution and Health

The reciprocal relationship between human behaviour and environment suggests that both human behaviour and environment influence quality of each other. When individuals are exposed to suboptimal environment, they may experience some sort of stress. That physical environment may produce behavioural, physiological, and cognitive consequences, which are inimical to the psychological and physical health of individuals. The results show

that the magnitude of correlations of environmental pollution with physical health was greater than its correlations with psychological health (Table 18 to 20). It indicates that with an increase in environmental problems, the physical health comparatively gets more affected than the psychological health. The Tables further reveals that physical health was positively correlated with intensity of water pollution and experienced pollution stress and problem-focused and emotion-focused coping strategies associated with garbage and water pollution. Therefore, the findings partially support the hypothesis (H₁₁) regarding the positive relationships between health and perceived intensity and experienced stress, and negative association with perceived control. The positive and significant relationship between physical health and perceived intensity of water pollution indicates that the respondents who increasingly perceived intensity of water pollution reported greater amount of physical health problems. The correlations between physical health and experienced pollution stress were found to be positive and significant. The findings suggest that people experienced greater amount of environmental stress and they reported greater physical health problems. The findings show that problem-focused coping for garbage had positive and significant correlation with physical health for female in general, and also in non-Bahal and non-migrant groups irrespective of gender. It implies that those respondents who used greater problem-focused coping strategies reported greater amount of symptoms related to physical health. Similarly, supporting the hypothesis (H₁₂) related to coping strategies and health, the findings reveal that physical health had significant and positive association with emotion-focused coping for garbage pollution for male, non-Bahal and migrant groups and also with emotion-focused coping for water pollution for all groups, except migrants. It also implies that respondents reported greater use of emotion-focused strategies and also more problems related to health. It suggests that people are using different strategies to deal with pollution, however, their physical health is also increasingly getting affected.

Psychological health had positive correlation with perceived intensity and experienced stress related to air pollution. It implies that respondents who increasingly perceived intensity and experienced stress related to air pollution reported greater amount of psychological health problems. Therefore, the findings support the hypothesis (H₁₃) in case of air pollution but rejects the hypotheses in relation to garbage and water pollution. However, the magnitude of correlation varies among the groups. The findings suggest that air pollution issues are important and related to psychological health. The correlation results indicated that perceived control over garbage and water pollution are negatively related to

psychological health supporting the hypothesis (H_{11}) regarding perception of control over pollution. It implies that the respondents who perceived lesser control over garbage and water pollution reported greater amount of psychological health problems.

Inter-relationships among the Variables of Environmental Pollution

The findings reveal that perceived intensity of all three aspects (air, garbage and water) of environmental pollution was found to be negatively correlated with perceived control, but the findings revealed positive relationships with experienced stress and with coping strategies (Table 21 to 26). It implies that individuals, who perceived greater intensity of environmental pollution, perceived lesser control over it and reported greater stress. The results also reveal that perceived control over the environmental pollution had negative correlations with experienced stress. This intriguing finding suggests that when individuals perceive greater intensity of environmental pollution and lesser control over them, they experience more stress. Researchers have consistently reported that uncontrollable environmental conditions cause greater stress in human beings (Baum & Paulus, 1987, Epstein, 1982, Cohen & Weinstein, 1982, Evans and Jacobs, 1981, Bell & Greene, 1982). According to the cognitive perspective of stress developed by Lazarus and his colleagues (Lazarus, 1966, Lazarus & Launier, 1978, Lazarus & Folkman, 1984ab, Cohen & Lazarus, 1979), appraisals of the situations and individuals' capabilities or resources are interrelated. If there is some imbalance between personal resources and the situational demands, it may cause stress. The results are interpreted following the concept of appraisals, since perceived intensity may be considered as the appraisal of situational demands and perceived control as the appraisal of capabilities or resources of the individuals. The results also reveal that perceived control had negative correlation with emotion focused coping, but positive correlation with problem focused coping. It implies that individuals who perceived less control over the environmental pollution reported more use of emotion-focused coping strategies and those who perceived greater control over the environmental pollution reported greater use of problem focused strategies. It indicates that perception of control has crucial roles for experiencing stress and selecting coping strategies.

Gender Difference in Environmental Perception, Experienced Stress, Coping, and Health

As conjectured, individuals with different roles would perceive the environmental conditions differently and also react to them differently. Males and females have different role relationships in the Nepalese society. The result of MANCOVA indicated that gender was a significant factor for overall differences. The results of univariate analyses of covariance reveal that males and females significantly differed in problem focused and emotion focused coping for water pollution, emotion focused coping for garbage pollution and psychological health (Table 27). The hypothesis (H_{13}) that males would use greater problem-focused coping to air pollution is not supported by the findings. The results support the hypothesis (H_{14}) that females use more problem-focused coping strategies for dealing with water pollution than males, but does not support the hypothesis in case of garbage. The results further support the hypothesis (H_{15}) that females used more emotion focused coping strategies to deal with garbage and water pollution. But the findings do not support the hypothesis regarding air pollution. As discussed earlier, in the Nepalese society like other South Asian countries, females are primarily responsible for cleaning the house, disposing garbage, preparing food for the family, managing water and similar other household chores. The differences in copings with garbage and water related problems fit with the females' role in the society. Female respondents emotionally reacted to garbage and water pollution. These are their everyday problems with which they have to confront and to solve them as their main responsibilities according to the work-distribution in the family. Siddiqui (1997) has also reported the differences between males and females in coping strategies dealing with garbage and water on her study of environmental and economic stressors of Delhi and Allahabad slums in India. Some researchers have reported gender differences in coping strategies that in general, women use emotion-focused coping, while men use problem-focused coping (Ptacek, Smith, & Zanas, 1992). Ptacek, Smith, and Dodge (1994) suggest that these differences are based on the different ways men and women are taught to cope with stress. But Porter and Stone (1995) have viewed that men and women report different problems as stressful and use coping strategies differently according to their problems.

The findings support the hypothesis (H_{15}) that females would report greater amount of psychological health problems than males, but do not support the hypothesis in relation to physical health. Although, there was no significant difference between males and females in physical health, but the Table 27 shows that females reported more symptoms of physical

health than males. There was significant difference between males and females in psychological health. Females reported more symptoms of psychological health than males. Women in Nepal like in other south Asian countries have profound pressure of household chores. On the other hand, they are less privileged as well as they are less cared for their wellbeing. In case of illness, they are ignored or paid less attention toward their health. Therefore, during the interview, when they were asked about health, naturally, they complained more health-related symptoms. Studies have indicated the impacts of air pollution on women's reproductive functions. Carbon monoxide is known to cause foetal death and brain damage (GOI, 1984). Problems during pregnancy as well as anaemia are aggravated by carbon monoxide toxicity. Apart from producing anaemia, colic and neuropathy, lead exposure is known to result in premature delivery, abortion, sterility, infant mortality and mental retardation (GOI, 1984). Women are also more susceptible to health problem from the biological factors; on the other hand, they have greater contact with contaminated water and garbage that consists of hazardous materials than men do. Additionally, of course, polluted sources of drinking water increases the women's workload in terms of larger investment of time and effort to purify and supply water for the whole family. These factors are supposedly associated with their health problems.

Location Difference in Environmental Perception, Experienced Stress, Coping, and Health

Evans and Cohen, (1987) have argued that a major source of information about stressors and various coping opportunities lie within the configuration of the physical environment. Therefore, it is necessary and important to study how people living in different physical surroundings perceive their environment and how they cope with environmental problems. The result of multivariate analysis of covariance revealed that location was significant factor for overall differences. The findings of univariate ANCOVAs revealed that Bahal (central city) and Non-Bahal (outskirts) respondents significantly differed in perceived control over garbage and water pollution (see Table 28). The Bahal group has the higher cell means on perceived control over garbage and water pollution, but not in the case of air pollution. The findings support the hypothesis (H₁₋₇) that the respondents in the Bahal location perceived greater control over garbage and water pollution than the respondents in non-Bahal location did. Probably, in Bahal, there exists the traditional method of garbage collection and disposal system and also people in Bahal live as a community. As discussed in the introduction, problems of water pollution and garbage in Kathmandu are not new. Since

people in Bahal are exposed to such condition for a longer period of time than in non-Bahal. Bahal people might have developed efficiency or skills to deal with water pollution and garbage enhancing their sense of control

The results further reveal that Bahal and non-Bahal respondents differ significantly in physical and psychological health. The findings supporting the hypothesis (H_{16}) indicate that non-Bahal respondents reported greater physical and psychological health problems than Bahal respondents did. The results may be interpreted with the results of perceived control over garbage and water pollution mentioned earlier. Although cause and effect can not be inferred from this study, it may be possible that the non-Bahal respondents perceived lesser control over garbage and water pollution, which may have resulted in their health status. Amazingly, there was no significant location difference found on perceived intensity, experienced stress, and coping strategies related to pollution and therefore, the hypotheses related to them are rejected.

Residential Status Difference in Environmental Perception, Experienced Stress, Coping, and Health

The result of MANCOVA revealed that a significant factor for residential status (migratory or non-migratory) for overall differences. The findings revealed that migratory and non-migratory residential status of the respondents differed significantly in perception of intensity of air pollution (Table 28). The result supports the hypothesis (H_{18}) that migrants would perceive greater intensity of air pollution. People who migrate from other towns or villages face more environmental problems in comparison to local residents of Kathmandu. Therefore, their perception of greater intensity of air pollution than the non-migrants is quite natural. Evans, Jacobs, and Frager (1982) have also reported that persons who had previously lived in high air pollution zones were less aware and less affected by poor quality in their current residence in a high pollution area, that they had recently migrated to, than new migrants who had previously lived in low pollution areas. The past exposure to the physical conditions that had low intensity may have affected to rate higher intensity of that dimension of physical conditions at the present moment than those who had been in exposure to high intensity of such conditions. Similar contention has been reported in crowding studies that previous crowding experience can facilitate tolerance in other crowding settings. Paulus (1988) found that prison inmates who had grown up in crowded homes or urban areas reacted less negatively to living in open dormitories than who had

grown up in less crowded environment. Wohlwill and Kahn (1973) reported that migrants to Harrisburg, Pennsylvania were more likely to report crowding if they came from smaller towns than if they came from larger ones. Nagar, Pandey, and Paulus (1988) have reported that the respondents with high experience of crowding were less negatively affected by high density on cognitive task than their counterparts with low experience of crowding. They suggest that individuals who have considerable crowding experiences should find crowding in laboratory situation relatively less unpleasant than those who had little crowding experience. The results reject the hypotheses regarding garbage and water pollution intensity as well as for experienced stress.

Migrants and non-migrants significantly differed in psychological health. The results support the hypothesis (H_{21}) that the migrants would report more symptoms related to psychological health than the non-migrants, but rejects the hypothesis for physical health. Mobility and migration have been viewed as stressful circumstances that related to higher illness rates (Kasl & Berkman, 1983, Lindheim & Syme, 1983; Micklin & Leon, 1978). Some others have also found greater psychological health problems among migrants than non-migrants. For example, Dube (1970) and Thacore (1973) have reported the prevalence of psychiatric and psychosomatic ailments among migrants in their studies in the Indian urban setting. However, the rate of incidence varied in different surveys- 370 per 1000 (Bhaskaran, Sethi, & Yadav, 1970) to 96 per 1000 (Sethi, Gupta, Raj Kumar, & Promilla, 1972). But the rate of incidence was higher among migrants than local residents.

The hypothesis (H_{19}) that non-migrant would perceive greater control over pollution than migrants was partially supported by the results (Table 28). The finding supports the hypothesis for perceived control over water pollution but does not support for perceived air and garbage pollution. Further, migrants and non-migrants significantly differed in emotion-focused coping to deal with water pollution, partially supporting the hypothesis (H_{20}). Migrants reported more use of emotion-focused coping to deal with water pollution than non-migrants. It seems that greater use of emotion-focused coping by migrants for dealing with water pollution is related to their perception of less control over water pollution. Several researchers have reported when individuals perceive lesser control over an aversive situation that increases negative emotion responding (emotion-focused coping strategies) associated with that situation (Avenill, 1973, Lefcourt, 1976).

Health as predicted by Background Characteristics of the Respondents and Their Perception of Environmental Pollution

As discussed in the introduction, physical conditions are critical determinants for quality of life of the city dwellers and their health. The results of multiple regression analysis revealed that greater amount of variance were accounted for physical health than psychological health by most of the predictor variables across the groups, except Bahal group (Table 29 & 31). Backward regression analysis revealed that among the groups of variables, experienced pollution stress significantly and consistently predicted physical health across the groups (Table 29). The findings suggest that experienced stress associated with pollution had a significant role in the physical health of urban dwellers. The other groups of predictor variables that were found to be significant for predicting physical health were perceived intensity of pollution and life events, but for only some groups.

The findings further provide the evidence that specifically, stress related to air pollution was the most significant predictor for explaining the variance of physical and psychological health (Tables 30 & 32). The variance that air pollution related stress accounted for physical health was greater than for psychological health. The percentage of variance explained for physical health by air pollution related stress varied across the groups (ranged from 0.09% to 7.5%). Similarly, psychological health was variably explained by air pollution related stress in different groups (The percentage of variance ranged from 0.09% to 6.7%). The greater percentage of variance explained for physical health by air pollution stress was found in non-migrant and male groups, explaining 7.5% and 7.3% of variance respectively. In case of psychological health, the greater percentage of variance explained for was found in the male group (6.7%). The findings suggest that physical and psychological health of males and non-migrants are comparably more associated with air pollution stress. It appears that since males have distinct roles in the labour distribution in the family. They are primarily responsible for doing jobs outside the house and are exposed to air pollution during their work. Therefore, it is natural to experience air pollution related stress for males and their health may be getting affected as they are exposed to many pollutants like lead, dust particles in air. As discussed earlier, experienced air pollution stress had positive correlation with physical and psychological health. It implies that people who experienced higher stress related to air pollution reported greater amount of physical and psychological health problems. In the introduction, the impact of air pollution on human health and well-being has been discussed. Therefore, the findings are in accordance with the results of earlier studies that air pollution stress has positive association with physical health. For

example, health problems such as respiratory and cardiovascular disorders have been firmly linked to air pollution (, Coffin & Stokinger, 1977; Evans & Jacobs, 1981; Goldsmith & Friberg 1977, Lebowitz, Cassell, & McCarroll, 1972; Sterling et al , 1966, Zeidberg Prindle, & Landu, 1964) Some investigators have found positive relationship between air pollution level and psychiatric admission rates (Briere et el , 1983; Strahilivitz et al., 1979) Evans et al (1987) ave also reported that poorer psychological health was positively associated with air pollution level

Life events accounted for a substantial amount of variance for physical and psychological health There was significant positive correlation between life events and health (physical and psychological) This implies that respondents who reported greater number of life events also reported greater amount of health problems Earlier studies also support such conclusion that an increase in life events tends to occur prior to onset of illness (Garrity & Max, 1979, Holmes & Masuda, 1974) Life events are also associated with stress related endocrine changes that may underlie enhanced vulnerability to illness (Mason, et al , 1970)

Physical health was also predicted by perceived intensity of water pollution. The percentage of variance explained by perceived intensity of water pollution for physical health varied across groups ranging from 1.6% to 7% (Table 30). The finding suggest that perceived intensity of water pollution was related to physical health, which is in accordance with the results of objective measures reported by some researchers. Researchers have been reporting the horrible state of water pollution in Kathmandu The levels of coliform contamination in drinking water are increasing each year exceeding the WHO standard for drinking water (Adhikari et al 1986; ENPHO, 1995, ENPHO/DISVI, 1990, Sharma 1978, 1986) Majority of hospital patients was found to be suffering from gastro-intestinal disorders, which are caused by waterborne pathogens (ADB, 1985)

The results of regression analysis reveal that age was found to be significant for males for predicting physical health (Table 30), but for females age was significant predictor for psychological health (Table 32) Age had negative association with physical and psychological health. Surprisingly, age was not found to be a common significant predictor for physical and psychological health in all groups.

Education significantly predicted physical and psychological health in a few groups. For non-migrants, education was important predictor variable for explaining physical and psychological health, but it was important predictor for explaining psychological health for Bahal group.

Perceived intensity of garbage pollution was a significant predictor variable for explaining physical health for females, but not for other groups. The finding is quite intriguing, because primarily, it was the responsibility of females to collect and dump the garbage on the bins located in their neighbourhoods. Many times, they are exposed to foul producing garbage heaps. Therefore, it is suggestive that they perceived higher intensity of garbage pollution and their health may have been affected by it. Such conclusion can not be inferred from this study because primarily this study is correlational. However, it seems logical that those who get in contact with hazardous wastes each day are more susceptible to have more physical health problems.

Backward regression showed that perceived intensity of air pollution, and perceived control over air and garbage pollution emerged as the significant predictors for psychological health, but they were not equally important predictors for all groups. Perceived intensity of air pollution significantly explained the variance for psychological health for female and non-migrant groups. Perceived control over air and garbage pollution significantly explained the variance for psychological health for non-migrant and migrant groups. The findings suggest that the predictor variables vary as the groups differ in their characteristics, therefore, the findings must be interpreted cautiously.

Background Characteristics of the Respondents and Their Perception of Pollution as the Predictors of Coping Strategies

Backward regression reveals that among the groups of variables, emotion-focused and problem-focused coping strategies were consistently predicted by perceived control over pollution and experienced pollution stress across the groups with some exceptions. For example, in the case of the male group, problem-focused coping, and in the case of the female and Bahal groups, emotion-focused coping were not significantly predicted. The

findings suggest that perceived control and experienced stress are crucial for selecting coping strategies. As discussed earlier, perceived control has positive association with problem-focused coping strategies, but it has negative relationship with emotion-focused strategies. It implies that those who perceived greater amount of control used greater amount of problem-focused coping strategies and those who perceived lesser control used greater amount of emotion-focused coping strategies. Further, perceived control had a negative correlation with experienced stress implying that those who perceived lesser control experienced greater amount of stress related to pollution. The findings indicate that perceived control had critical role in the selection of coping strategies. In general, researchers have reported that problem-focused coping is more likely when situational demands are appraised as controllable, emotion-focused coping is more likely when demands are seen as uncontrollable (Billings et al., 1983, Coyne, Aldwin, & Lazarus, 1981, Folkman, 1984, Folkman & Lazarus 1980, 1985, Folkman et al., 1986, Forsythe & Compas, 1987, Stone & Neale, 1984, Thoits, 1991).

Limitations and Emerging Research Questions

The study has a few limitations. This study was primarily planned to investigate the city dwellers' perception of environmental condition, their experience of stress, coping strategies and health in relation to air, garbage and water pollution. The findings of the study are limited to only these three types of pollution. But there are many other stressors in the urban environment such as population density, noise, and so on, several socio-economic stressors like poverty, unemployment, inadequate family income, crimes and street fights, and hassles like strenuous job conditions, commuting, poor neighbourhood and so on, which are not covered in the present study. All of these socio-economic and environmental conditions are linked with health and well being of the people. We may be able to predict health status and well being of people more meaningfully, if we combine all these factors that are associated with them. Therefore, to understand the overall urban problems and their impact on health, it is necessary to study the socio-economic, demographic, environmental and psychological factors.

The study was conducted in Kathmandu, the capital city of Nepal, therefore, caution is warranted while over generalising the findings. Further research may be conducted by including other cities to test whether the similar results are found in other settings with similar environmental conditions.

The size of sample of the present study was rather small (N=209). Respondents were selected from four locations of two types of neighbourhoods. The respondents were primarily lower-middle class urbanites and therefore, the findings may not be generalised for all socio-economic levels of people. It is essential to include different levels of socio-economic groups to acquire better understanding how people perceive and deal with their environmental conditions and the extent to which their health is affected. We can generalise the findings more precisely if we select a larger sample from different locations.

The findings of the present study reveal and imply that age, education and family income are important background variables determining environmental perceptions, stress and using coping strategies to deal with environmental pollution. For future research, it is essential to study environmental stressors in relation to multiple age groups, educational background and income groups to understand why and how these groups differ in their perceptions and reactions.

Health has been a major research area in relation to environmental stress. In this study, some physical ailments and psychological symptoms related to health were inquired to measure the health status of individuals which have partially revealed the health status of city dwellers. To understand complete health status of urban residents, it is essential to investigate their health behaviours such as visits to hospital or medical professionals, common health problems in the family members, and frequency of exposures to environmental stressors or pollution. Knowledge about the impacts of environmental pollution (stressors) and awareness and concern regarding the urban environmental situation, individual, collective and institutional resources for dealing with environmental and other similar problems are essential to be included for study in future research. The findings suggest that female in general and migrants irrespective of gender have greater health problems than their male and non-migrant counterparts. Therefore, particularly, more attention and care should be given to improve the health condition of females and migrants.

For future study, people with health problems may be separately studied to investigate the linkage between their illness and environmental pollution. Especially, extreme cases of illness may be taken for the study and case study method may be applied to know the nature of relationship between illness and exposures of environmental pollution. It may be interesting to study those families who are suffering from chronic illnesses. It may help us

to understand the nature of illness in relation to environmental condition. It may be helpful to include research questions regarding the duration and frequencies of people's exposure to pollution, their perception of control, experienced stress, coping strategies, and the impact of it on health. The longitudinal study should be carried out probably every year so that we are able to understand people's perception, suffering, and coping in the degraded environmental condition.

Individuals vary in their perceptions and in the coping strategies they use to deal with environmental stress. In this research, only six items of coping strategies grouped into two major categories (emotion and problem-focused) of coping were included. For future research, more items of coping strategies associated with environmental problems should be included to understand human behaviour in relation to environmental conditions.

Policy Implications and Intervention

Pollution level in the urban environment is increasing with the growth of urban population making the existing water supply, garbage collection and disposal, air quality and so on more problematic and affecting the quality of life of the urban dwellers. The negative impact of declined urban environment on health has been reported by a number of investigators (Evans & Cohen, 1987, Jain, 1987, Jain & Preet, 1983; Lepore, Evans, & Palsane, 1991; Lepore, Palsane, & Evans, 1991, Ruback, Pandey, & Begum, 1997; Siddiqui, 1997).

J. Pandey (1998) have argued that 'to a great extent environmental problems are like tragedies of commons. When persons pursue their individual self-interest rather than act in the long-term common interest, they create social traps which harm people individually and collectively' (1990). Many of the mundane environmental problems of disastrous proportions are a result of the social traps created by individuals' behaviour and by actions of certain communities, societies, vested interest groups (i.e., industries), and wrong developmental strategies (p. 206). To overcome the environmental problems (i.e., social traps) we need to make environmental policies and implement them seriously. However, there is lack of awareness among people regarding the effects of environmental pollution and the Governments of the developing world have given less priority for the environmental issues. Therefore, to improve the quality of environment and to enhance the quality of life including health and well being of people, these issues are needed to be addressed seriously.

Environmental issues are not limited to national boundaries and they need collective efforts. Hence, environmental policy and intervention programmes should be carried out at international, national and local levels.

The findings revealed that people with increasing educational levels use greater amount of problem-focused coping and also report lesser amount of health problems. The findings suggest that education is one of the critical factors for effective dealing with pollution. Therefore, it is particularly essential to provide environmental education to people that may help them to acquire knowledge and develop efficacy to deal more effectively with environmental problems. Awareness regarding the sources of pollution of various kinds, their impact on health and well being of people as well as remedies of the problems should be spread through mass media effectively. People should be educated and motivated to adopt pro-environmental behaviour and actions. Government should make laws to discourage unhealthy environmental behaviours and encourage activities related to environmental protection. Government should make policies giving priorities to provide education and health-care facilities, and economic opportunities in villages, which may be helpful to control the process of migration from villages to the city.

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APPENDIX

APPENDIX —A

वातावरण सम्बन्धी सर्वेक्षण

यो सर्वेक्षण वातावरणसँग सम्बन्धित छ । हामी तपाईंसँग करिब ३० मिनेट जति कुराकानी गर्नेछौं । जसमा टोल तथा छर-छिमेकको बारेमा तपाईंसँग केही प्रश्नहरू गरर तपाईंको बिचार जान्न चाहन्छौं । तपाईं जस्तै अन्य व्यक्तिहरू पनि यस सर्वेक्षणमा भाग लिनेछन् । तपाईंले विनुभएको उत्तरसँग तपाईंको नाम जोडिने छैन । अतः निःसंकोच भएर उत्तर दिनुहोस् ।

धन्यवाद ।

अर्जुन कुमार उदास

शोधछात्र
मनोविज्ञान विभाग
इलाहाबाद विश्वविद्यालय

निर्देशन

१ यो प्रश्नावलीमा केही प्रश्नहरूको उत्तर हो वा होइन भनेर दिन पर्नेछ । केहीमा तपाईंले जानकारी दिन पर्नेछ ।

२. धेरैजसो प्रश्नहरूको उत्तर

१ कहिलेपनि २ विरलै ३ कहिलेकाहीँ ४ धेरैजसो ५ सधैंजसो मध्ये कुनै एउटा छानेर दिन सकिने छ ।

उदाहरणको लागि

—म चिया पिउँछु ।

१. कहिलेपनि २ विरलै

३ कहिलेकाहीँ

४ धेरैजसो

५ सधैंजसो

१ यदि कसैले “कहिलेपनि” रोज्छ भने यस्को अर्थ ऊ “बिलकुलै” चिया पिउँदैन ।

२ यदि कसैले “विरलै” रोज्छ भने यस्को अर्थ ऊ “थोरै” चिया पिउँछ ।

३ यदि कसैले “कहिलेकाहीँ” रोज्छ भने यस्को अर्थ ऊ “धेरैधोर” चिया पिउँछ ।

४ यदि कसैले “धेरैजसो” रोज्छ भने यस्को अर्थ ऊ “धेरै” चिया पिउँछ ।

५ यदि कसैले “सधैंजसो” रोज्छ भने यस्को अर्थ ऊ “ज्यादै धेरै” चिया पिउँछ ।

३ तपाईंलाई सोधिने प्रश्नहरूको सही वा गलत उत्तरहरू छैनन् । तपाईंले दिनुभएको उत्तरहरू मात्र यो शोधको लागि उपयोगी हुनेछन् ।

४. मनमा स्वाभाविक रूपले आउने उत्तरहरू दिनुहोस् र कुनै पनि प्रश्नलाई धेरै समय नलगाउनु होस् । कृपया सबै प्रश्नहरूको उत्तर दिनुहोस् ।

५. यदि केही प्रश्नहरू एउटै जस्ता लागे पनि सबै प्रश्नहरूको उत्तर दिनुहोस् ।

६. यदि प्रश्नावली वा शोधको बारेमा केही भन्न चाहनुहुन्छ भने कृपया तहिल्किकाइकन भन्नुहोस् ।

टोलको नाम

टोल शहरको कुन भागमा पर्छ ?

१. मुख्य शहरको बीचमा

२ मुख्य शहरभन्दा बाहिर

व्यक्तिगत विवरण

सबैभन्दा पहिले हामी तपाईंको बारेमा केही कुराहरू जान्न चाहान्छौं ।

१. लिंग -

१ पुरुष

२ स्त्री

२ तपाईंको उमेर कति भयो ?

वर्ष

३ तपाईं कुन धर्म मान्नुहुन्छ ?

१ हिन्दु

२ बौद्ध

३ मुस्लिम

४ क्रिश्चियन

५ अन्य

४. तपाईंको जाति के हो ?

१ बाहुन

२ क्षेत्री

३ नेवार (.)

४. राई/लिम्बु/गुरुङ/तामाङ/थकाली

५. दमाई/कामी/सार्की/पोडे ६ अन्य

५ तपाईं के काम गर्नु हुन्छ ?

१ बेरोजगार/गृहीणी

२ मजदुर

३ जातिगत पेशा

४ दक्ष कालिगढ/मेकानिक्स

नोकरी (

) ६ व्यापार (

) ७ अन्य (

६ तपाईंले कति पढ्नु भएको छ ?

१ निरक्षर

२ साक्षर

३ प्राथमिक

४ निम्न माध्यामिक

५ टेष्ट पास

६ एस एल सी

७ आई ए वा सो सरह

८ बि ए वा सो सरह

९ एम ए वा सो सरह र सो भन्दा माथि

७ तपाईंको परिवारका कति जना यो घरमा बस्नुहुन्छ ?

जना

८ परिवारको किसिम- १. एकल परिवार (पति, पत्नी र आफ्ना छोराछोरीहरूमात्र) २. संयुक्त परिवार

९. यस शहरमा बस्नु भएको कति वर्ष भयो ? वर्ष/जन्मैदेखि (यदि जन्मैदेखि भए प्रश्न न १० नसोध्ने)

१० यो शहरमा बस्नुभन्दा पहिले के तपाईं अरु कुनै ठाउँमा बस्नुहुन्थ्यो ? १ हो २ होइन
यदि हो भने

(क) कहाँ बस्नुहुन्थ्यो ? १ गाउँमा २ शहरमा

(ख) त्यहाँ कति वर्ष बस्नु भयो ? वर्ष

वार्षिक स्थिति मापनी :

अब हामी तपाईंको परिवारको आर्थिक स्थितिको बारेमा केही जान्न चाहन्छौं ।

११ तपाईंको परिवारमा कतिजना अर्थ उपार्जन गर्ने (पैसा कमाउने) काममा लागेका छन् ? जना

१२ सबै स्रोतहरू मिलाएर तपाईंका परिवारका सदस्यहरूले मासिक कति कमाउनुहुन्छ, कृपया भन्नुहोस् ।

	मजदुरी बाट	कारीगरीबाट	नोकरीबाट	ब्यापारबाट	अन्य	जम्मा
१. स्वयं						
२.						
३.						
४						

टोल सम्बन्धी

हरेक मानिसलाई आफु बसेको ठाउँको केही पक्षहरू राम्रा लाग्छन्, केही राम्रा लाग्दैनन् । अब भन्नुहोस्, तपाईंलाई आफु बसेको ठाउँ कस्तो लाग्छ ।

१३ यो टोल तपाईंलाई कति राम्रो वा नराम्रो लाग्छ ?

१. ज्यादै राम्रो २ राम्रो ३ अनिश्चित ४ नराम्रो ५ ज्यादै नराम्रो

१४ यो टोल तपाईंलाई कति सुन्दर वा कुरूप लाग्छ ?

१. ज्यादै सुन्दर २ सुन्दर ३ अनिश्चित ४ कुरूप ५ ज्यादै कुरूप

१५ यो टोल कति रमाइलो वा नरमाइलो लाग्छ ?

१. ज्यादै रमाइलो २ रमाइलो ३ अनिश्चित ४ नरमाइलो ५ ज्यादै नरमाइलो

१६ यो टोल कति आरामदायी वा कष्टदायी छ ?

१. ज्यादै आरामदायी २ आरामदायी ३ अनिश्चित ४ कष्टदायी ५ ज्यादै कष्टदायी

१७ यो टोलबाट तपाईं कति सन्तुष्ट वा असन्तुष्ट हुनुहुन्छ ?

१. ज्यादै सन्तुष्ट २ सन्तुष्ट ३ अनिश्चित ४ असन्तुष्ट ५ ज्यादै असन्तुष्ट

टोलको फोहोर-मैला, दूषित हावा र पानी सम्बन्धी

प्रशानाबलीको यो भागमा तपाईंको टोलको फोहोर-मैला, दूषित (धुवाँ, ग्याँस र पानी) को बारेमा तपाईंसँग केही जानकारी लिन चाहन्छौं ।

१८ तपाईंको घरको ढोकाबाट टोलमा फोहोर-मैला धुपार्ने ठाउँ कति नजिक छ ?

१ ५ मीटर भन्दाकम

२ ६-१० मीटर

३ ११-१५ मीटर

४ १६-२० मीटर

५ २१ मीटर वा भन्दाबढी

१९ तपाईंको टोलमा हरेक दिन कति फोहोर-मैला जम्मा हुन्छ ?

१ बिल्कुलै हुँदैन

२ धेरै

३ धेरै-धेरै

४ धेरै

५ ज्यादै धेरै

२० टोलको फोहोर-मैलाको थुप्रोबाट कति दुर्गन्ध आउँछ ?

१ बिल्कुलै आउँदैन २ थोरै ३ धेरै-थोरै ४ धेरै ५ ज्यादै धेरै

२१ हरेक दिन तपाईं कतिबटा फोहोर-मैलाको थुप्रो छेउ भएर हिँड्नुहुन्छ ?

१ बिल्कुलै हिँड्दिन २ १ वा २ थुप्रो ३ ३ वा ४ थुप्रो ४ ५ वा ६ थुप्रो ५ ७ थुप्रो वा भन्दा बढि

२२ गत हप्ता तपाईंले कति पटक फोहोर-मैलाको थुप्रो आफ्नो टोलमा देख्नु भयो ?

१ कहिले पनि देखिन २ विरलै ३ कहिलेकाहीँ ४ धेरैजसो ५ सधैंजसो

२३ तपाईंको टोलमा कति दूषित हावा (धुँवा, ग्याँस) हुने गर्छ ?

१ बिल्कुलै हुँदैन २ थोरै ३ धेरै-थोरै ४ धेरै ५ ज्यादै धेरै

२४ हरेक दिन कति पटक दूषित हावाको सम्पर्कमा रहनुहुन्छ ?

१ बिल्कुलै रहदिन २ १ वा २ पटक ३ ३ वा ४ पटक ४ ५ वा ६ पटक ५ ७ पटक वा भन्दा बढि

२५ गतहप्ता तपाईंले कति पटक दूषित हावा आफ्नो टोलमा पाउनुभयो ?

१ कहिलेपनि पाइन २ विरलै ३ कहिलेकाहीँ ४ धेरैजसो ५ सधैंजसो

२६ तपाईंको धारामा आउने पानी कति दूषित छ ?

१ बिल्कुलै छैन २ थोरै ३ धेरैथोरै ४ धेरै ५ ज्यादै धेरै

२७ एक हप्तामा कति दिन तपाईंको धारामा दूषित पानी आउँछ ?

१ बिल्कुलै आउँदैन २ १-२ दिन ३ ३-४ दिन ४ ५-६ दिन ५ ७ दिन

२८ गत हप्तामा कति पटक तपाईंले दूषित पानी आफ्नो धारामा पाउनुभयो ?

१ कहिले पनि पाइन २ विरलै ३ कहिलेकाहीँ ४ धेरैजसो ५ सधैंजसो

अब म तपाईंको बारेमा केही कथनहरू भन्न गइरहेको छु । प्रत्येक कथनहरूलाई ध्यानपूर्वक सुन्नुहोस् र भन्नुहोस्, यी कथनहरू तपाईंलाई कुन हदसम्म लाग्नु हुन्छन् ।

१ बिल्कुलै २ थोरै ३ धेरैथोरै ४ धेरै ५ ज्यादै धेरै मध्ये कुनै एक रोजेर उत्तर दिनुहोस् ।

२९. फोहोर-मैलाबाट हुने हानीबाट आफुलाई बचाउन सक्नुहुन्छ ।

१ बिल्कुलै होइन २ थोरै ३ धेरैथोरै ४ धेरै ५ ज्यादै धेरै

३० महानगरपालिकालाई भनेर आफ्नो टोल सफा गराउन सक्नुहुन्छ ।

१ बिल्कुलै होइन २ थोरै ३ धेरैथोरै ४ धेरै ५ ज्यादै धेरै

३१. टोलवासीहरूलाई कम्बिन्स गरेर आफ्नो टोल सफा गराउन सक्नुहुन्छ ।

१ बिल्कुलै होइन २ थोरै ३ धेरैथोरै ४ धेरै ५ ज्यादै धेरै

३२. तपाईं आफ्नो घरवरिपरि सफा राख्न सक्नुहुन्छ ।

१ बिल्कुलै होइन २ थोरै ३ धेरैथोरै ४ धेरै ५ ज्यादै धेरै

३३. दूषित हावाबाट हुने हानीबाट आफुलाई बचाउन सक्नुहुन्छ ।

१ बिल्कुलै होइन २ थोरै ३ धेरैथोरै ४ धेरै ५ ज्यादै धेरै

३४. सम्बन्धित अफिसलाई भनेर आफ्नो टोलमा वायुप्रदूषण कम गराउन सक्नुहुन्छ ।

१ बिल्कुलै होइन २ थोरै ३ धेरैथोरै ४ धेरै ५ ज्यादै धेरै

३५. तपाईंले आफ्नो घर वर-परको वातावरणमा हावा स्वच्छ राख्न सक्नुहुन्छ ।

१ बिल्कुलै होइन २ थोरै ३ धेरैथोरै ४ धेरै ५ ज्यादै धेरै

३६ दूषित पानीबाट हुने हानीबाट आफुलाई बचाउन सक्नुहुन्छ ।

- १ बिलकुलै होइन २ थोरै ३ धेरैथोरै ४ धेरै ५ ज्यादै धेरै

३७ खानेपानी सस्यानलाई भनेर आफ्नो टोलमा सफा पानीको आपूर्ति (सप्लाई) गराउन सक्नुहुन्छ ।

- १ बिलकुलै होइन २ थोरै ३ धेरैथोरै ४ धेरै ५ ज्यादै धेरै

३८ आफुलाई चाहिने जति पानी सफा गर्न सक्नुहुन्छ ।

१. बिलकुलै होइन २. थोरै ३. धेरैथोरै ४. धेरै ५. ज्यादै धेरै

काठमाडौं शहर भित्र रहेको टोलको फोहोर-मैला, दूषित हावा र पानीको बारेमा केही कुरा जान्न चाहन्छौं । टोलमा हुने फोहोर-मैला, दूषित हावा र पानीको बारेमा टोलका बासिन्दाहरूले नै बताउन सक्छन् । मानिसहरू यी समस्याहरूसँग जुम्न कहिले विभिन्न कार्यहरू गर्दछन्, कहिले यिनीहरूबाट तर्किन्छन्, कहिले यिनीहरूको बारेमा जानकारी लिन्छन्, कहिले यिनीहरूलाई बास्ता गर्दैनन्, कहिले केहीपनि गर्दैनन् र कहिले यिनीहरूलाई यहाँको वास्तविकता मान्ने गर्छन् । अब हामी जान्न चाहन्छौं, तपाईं यी समस्याहरूले गर्दा कति दिक्क हुनुहुन्छ वा तपाईंलाई कति अष्टयारो परेको छ । गत महिनालाई ध्यानमा राखेर भन्नुहोस्, तपाईं यी समस्याहरूलाई समाधान गर्न कुन-कुन तरिकाहरू कति उपयोग गर्दै आउनु भएकोछ ।

३९ टोलको फोहोर मैलाबाट तपाईं कति दिक्क हुनुहुन्छ ?

- १ बिलकुलै छैन २ थोरै ३ धेरैथोरै ४ धेरै ५ ज्यादै धेरै

४० टोलमा फोहोरमैलालेगर्दा हिड्डुल गर्न तपाईंलाई कति अष्टयारो परेकोछ ?

१. बिलकुलै छैन २ थोरै ३ धेरैथोरै ४ धेरै ५ ज्यादै धेरै

४१ यहाँको फोहोरमैलाले हैजा, प्लेग जस्ता रोगहरू फैलिन्छ भनेर तपाईंलाई कति डर लाग्छ ?

- १ बिलकुलै लाग्दैन २ थोरै ३ धेरैथोरै ४ धेरै ५ ज्यादै धेरै

अब फोहोर-मैला हुन्छ, तब यस्तो स्थितिमा

४२. तपाईं कति पटक बरिपरको फोहोर-मैला सफा गर्नुहुन्छ ।

- १ कहिलेपनि २ बिरलै ३ कहिलेकाहि ४ धेरैजसो ५ सधैजसो

४३. तपाईं कति पटक फोहोर-मैला घुम्ने ठाउँमा जाने गर्नुहुन्छ ।

१. कहिलेपनि २. बिरलै ३. कहिलेकाहि ४. धेरैजसो ५ सधैजसो

४४ तपाईं कति पटक फोहोर-मैलाको बारेमा जानकारी लिने गर्नुहुन्छ ।

- १ कहिलेपनि २. बिरलै ३. कहिलेकाहि ४ धेरैजसो ५ सधैजसो

४५ तपाईं कति पटक फोहोर-मैलालाई बास्ता गर्नुहुन्छ ।

- १ कहिलेपनि २ बिरलै ३ कहिलेकाहि ४. धेरैजसो ५ सधैजसो

४६. "फोहोर-मैला यहाँको अभिन्न अंग भैसकैको छ" यस्तो तपाईंलाई कति पटक लाग्छ ।

- १ कहिलेपनि २. बिरलै ३ कहिलेकाहि ४. धेरैजसो ५ सधैजसो

४७. कति पटक चाहेर पनि केही गर्नुहुन्छ ।

- १ कहिलेपनि २ बिरलै ३ कहिलेकाहि ४. धेरैजसो ५ सधैजसो

४८ टोलको दूषित हावाबाट तपाईं कति दिक्क हुनुहुन्छ ।

- १ बिलकुलै छैन २ थोरै ३ धेरैथोरै ४ धेरै ५ ज्यादै धेरै

४९. यहाँको दूषित हावाले तपाईंलाई सास फेर्न कति अघ्यारो परेकोछ ।

१ बिलकुलै छैन २ थोरै ३. धेरथोर ४. धेरै ५. ज्यादै धेरै

५०. यहाँको दूषित हावाले दम, ब्रोन्काईटिस जस्ता रोगहरु फैलिन्छ भनेर तपाईंलाई कति डर लाग्छ ?

१ बिलकुलै लाग्दैन २. थोरै ३. धेरथोर ४. धेरै ५. ज्यादै धेरै

जब टोलको हावा दूषित हुन्छ, यस्तो स्थितिमा

५१. तपाईं कति पटक सास फेर्न बन्द गर्नुहुन्छ वा नाक-मुख छोप्नुहुन्छ ।

१. कहिलेपनि २. विरलै ३. कहिलेकाहिं ४. धेरैजसो ५. सधैजसो

५२. तपाईं कति पटक दूषित हावा भएको ठाउँमा जाने गर्नुहुन्छ ।

१ कहिलेपनि २. विरलै ३. कहिलेकाहिं ४. धेरैजसो ५. सधैजसो

५३. तपाईं कति पटक दूषित हावा बारेमा जानकारी लिने गर्नुहुन्छ ।

१. कहिलेपनि २. विरलै ३. कहिलेकाहिं ४. धेरैजसो ५. सधैजसो

५४. तपाईं कति पटक दूषित हावालाई बास्ता गर्नुहुन्छ ।

१. कहिलेपनि २. विरलै ३. कहिलेकाहिं ४. धेरैजसो ५. सधैजसो

५५. "दूषित हावा यहाँको अभिन्न अंग भैसकैको छ," यस्तो तपाईंलाई कति पटक लाग्छ ।

१. कहिलेपनि २. विरलै ३. कहिलेकाहिं ४. धेरैजसो ५. सधैजसो

५६. कति पटक चाहेर पनि केही गर्नुहुन्छ ।

१. कहिलेपनि २. विरलै ३. कहिलेकाहिं ४. धेरैजसो ५. सधैजसो

५७. टोलमा दूषित पानीको सप्लाईबाट तपाईं कति दिक्क हुनुहुन्छ ?

१. बिलकुलै छैन २ थोरै ३. धेरथोर ४. धेरै ५. ज्यादै धेरै

५८. दूषित पानीको सप्लाईबाट तपाईंलाई पानी पिउन कति अघ्यारो परेकोछ ?

१ बिलकुलै छैन २ थोरै ३. धेरथोर ४. धेरै ५. ज्यादै धेरै

५९. यहाँको दूषित पानीले भाडा पखाला, जन्डिस, टायफायड जस्ता रोगहरु फैलिन्छ भनेर तपाईंलाई कति डर लाग्छ ?

१ बिलकुलै छैन २ थोरै ३. धेरथोर ४. धेरै ५. ज्यादै धेरै

जब धारामा दूषित पानी आउँछ, यस्तो स्थितिमा

६०. तपाईं कति पटक पिउने पानी छान्ने वा उमाल्ने गर्नुहुन्छ ।

१. कहिलेपनि २. विरलै ३. कहिलेकाहिं ४. धेरैजसो ५. सधैजसो

६१. तपाईं कति पटक धाराको पानी सोभै पिउने गर्नुहुन्छ ।

१. कहिलेपनि २. विरलै ३. कहिलेकाहिं ४. धेरैजसो ५. सधैजसो

६२. तपाईं कति पटक दूषित पानीको बारेमा जानकारी लिने गर्नुहुन्छ ?

१. कहिलेपनि २. विरलै ३. कहिलेकाहिं ४. धेरैजसो ५. सधैजसो

६३. तपाईं कति पटक दूषित पानीलाई बास्ता गर्नुहुन्छ ?

१ कहिलेपनि २. विरलै ३. कहिलेकाहिं ४. धेरैजसो ५. सधैजसो

६४. 'दूषित पानी यहाँको अभिन्न अंग भैसकैको छ,' यस्तो तपाईंलाई कति पटक लाग्छ ?

१ कहिलेपनि २. विरलै ३. कहिलेकाहिं ४. धेरैजसो ५. सधैजसो

६५. कति पटक चाहेर पनि केही गर्नुहुन्छ ।

१ कहिलेपनि २. विरलै ३. कहिलेकाहिं ४. धेरैजसो ५. सधैजसो

गत महिनामा यी मध्ये कुनकुन घटनाहरु तपाईंसँग घटे

बिभिन्न मानिससँग जिवनमा बिभिन्न घटनाहरु घट्न सक्छन् । प्रश्नावलीको यस भागमा हामी जान्न चाहान्छौं, गत १२ महिना भित्र यी घटनाहरु तपाईं वा तपाईंको परिवारसँग घटे वा घटेनन् ।

६६. तपाईंलाई गम्भिर बيمारी वा चोट लाग्यो ।	१ हो	२ होइन
६७. परिवारको कुनै सदस्य गम्भिर बيمारी भए ।	१ हो	२. होइन
६८. गर्भ रह्यो (आफ्नो वा परिवारको कसैमा) ।	१ हो	२. होइन
६९. गर्भपात वा बच्चाको मृत्यु भयो ।	१. हो	२. होइन
७०. परिवारमा कसैको मृत्यु भयो ।	१ हो	२. होइन
७१. मिल्ने साथीको मृत्यु भयो ।	१ हो	२. होइन
७२. पुलिससँग भ्रमेला, कानुनी समस्या भयो, अदालत जानुपर्थ्यो ।	१ हो	२ होइन
७३. सरकारी अधिकारीसँग समस्या भयो ।	१ हो	२ होइन
७४. कसैले आक्रमण गर्‍यो, धम्की दियो ।	१. हो	२. होइन
७५. घनसम्पत्तिको चोरी वा नोक्सानी भयो ।	१. हो	२ होइन
७६. रुपैया पैसाको ज्यादै अभाव(कमि) भयो ।	१ हो	२. होइन
७७. परिवारमा झगडा भयो ।	१ हो	२ होइन

हाम्रा भावनाहरूसँग सम्बन्धित कथनहरु भन्न गइरहेको छु । कृपया ध्यान दिएर सुन्नुहोस् र भन्नुहोस्, गत महिनामा यी भावनाहरु तपाईंले कति पटक अनुभव गर्नु भयो ।

७८. के गर्ने के नगर्ने भनेर अल्मलिने ।	१ कहिलेपनि	२. बिरलै	३. कहिलेकाही	४ धेरैजसो	५ सधैँजसो
७९. तनाव (टेन्सन) हुने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैँजसो
८०. एकलोपन अनुभवहुने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४. धेरैजसो	५. सधैँजसो
८१. उदास हुने ।	१. कहिलेपनि	२. बिरलै	३. कहिलेकाही	४ धेरैजसो	५ सधैँजसो
८२. सानो कुरामा पनि आत्तिने ।	१. कहिलेपनि	२ बिरलै	३ कहिलेकाही	४. धेरैजसो	५ सधैँजसो
८३. बेचैनी हुने (छटपटी लाग्ने) ।	१. कहिलेपनि	२. बिरलै	३. कहिलेकाही	४ धेरैजसो	५. सधैँजसो
८४. कुनै पनि काममा मन नलाग्ने ।	१ कहिलेपनि	२. बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैँजसो
८५. आफु कामै नलाग्ने मान्छे जस्तो लाग्ने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४. धेरैजसो	५. सधैँजसो
८६. निन्द्रा राम्रोसँग नलाग्ने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैँजसो
८७. फतक्क रिस उठ्ने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैँजसो
८८. बिनामिति चिन्ता हुने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैँजसो
८९. झर्को लाग्ने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैँजसो
९०. खुसी नलाग्ने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैँजसो

शारीरिक लक्षणहरू

तल स्वास्थ्यसँग जोडिएका केही लक्षणहरू दिईएका छन् जुन धेरै मानिसहरूले अनुभव गर्दछन् । अब भन्नुहोस्, गत महिना तपाईंले यी लक्षणहरू अनुभव गर्नुभयो कि गर्नुभएन । यदि गर्नु भएको भए कति पटक गर्नुभयो ?

९१ टाउको दुख्ने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो
९२ मुटुको दुकदुकी बढ्ने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो
९३ सास फेर्दा अफठ्यारो हुने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो
९४ धेरै चिलाउने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो
९५ कान दुख्ने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो
९६ पेट गडबड हुने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो
९७ नाक बन्द हुने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो
९८ चिटचिट पसिना आउने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो
९९ आँखाबाट पानी आउने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो
१०० छाती दुख्ने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो
१०१ मासपेशीहरूमा पिडा ।	१ कहिले पनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो
१०२. अनुहार रातो हुने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो
१०३. रिंगटा लाग्ने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो
१०४ चाडै थकाई लाग्ने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो
१०५. जिउ दुख्ने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो
१०६ खान मन नलाग्ने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो
१०७. चाडै रुघा लाग्ने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो
१०८ सास बढ्ने ।	१ कहिले पनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो
१०९ आँखा पोल्ने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो
११० बाक्ला आउला आउला जस्तो हुने ।	१ कहिलेपनि	२ बिरलै	३ कहिलेकाही	४ धेरैजसो	५ सधैंजसो